



MINISTRY OF HEALTH

Final Report
of
Departmental Committee
on
Maternal Mortality & Morbidity

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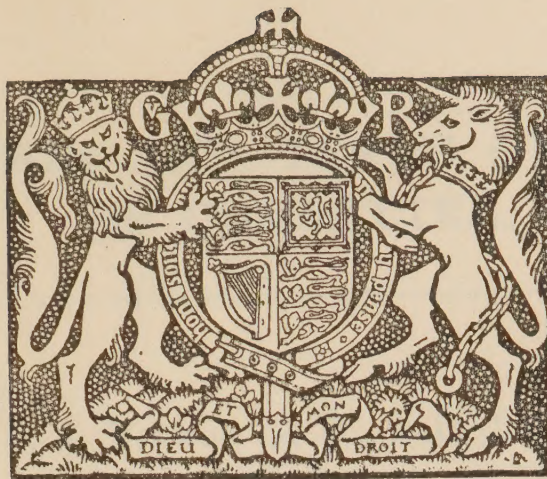
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CONSTITUTION AND TERMS OF REFERENCE OF COMMITTEE.

I hereby appoint—

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- * Dame Janet M. Campbell, D.B.E., M.D., M.S.
- * Mrs. Ethel Cassie, M.D.
- Leonard Colebrook, Esq., M.B.
- Professor Archibald Donald, M.D., F.R.C.P.
- C. E. S. Flemming, Esq., M.R.C.S., L.R.C.P.
- * Sir Walter M. Fletcher, K.B.E., C.B., M.D., F.R.C.P.,
F.R.S.
- * Harold Kerr, Esq., O.B.E., M.D.
- * Sir George Newman, K.C.B., M.D., F.R.C.P.
- * W. H. F. Oxley, Esq., M.R.C.S., L.R.C.P.
- Professor Miles H. Phillips, M.B., F.R.C.S.
- C. E. Tangye, Esq., M.D.
- Professor O. L. V. S. de Wesselow, M.B., F.R.C.P.

to be a Departmental Committee to advise upon the application to maternal mortality and morbidity of the medical and surgical knowledge at present available, and to inquire into the needs and direction of further research work.

I further appoint Sir George Newman to be Chairman and Mrs. Margaret Hogarth, M.B., of the Ministry of Health, to be Secretary, of the Committee.

(Signed) N. CHAMBERLAIN.

4th June, 1928.

Note.—Dr. Hogarth was unable to undertake the duties of Secretary, which have been discharged by Miss Jane H. Turnbull, C.B.E., M.D., one of the Medical Officers of the Ministry of Health.

The cost of the preparation of this Report, including the expenses of the Committee, is £662 18s. 8d., of which £103 represents the gross cost of printing and publishing the Report.

DEPARTMENTAL COMMITTEE ON MATERNAL MORTALITY AND MORBIDITY.

FINAL REPORT.

TABLE OF CONTENTS.

CHAPTER I.—INTRODUCTION.

	PAGE
The Committee's Interim Report ; scope ; general conclusions ...	10
Action arising out of the recommendations :	
General Medical Council and education in obstetrics of medical students	10
Ministry of Health and comprehensive maternity services ...	11
Scope of present Report	11

CHAPTER II.—MATERNAL DEATH INVESTIGATION.

Classification of causes of maternal death	13
Clinical points :	
Sepsis	14
Eclampsia	14
Shock, ante-partum haemorrhage	15
Post-partum haemorrhage	16
Other toxaemias, embolism, extra-uterine gestation	16
Abortion ; Registrar-General's figures ; lack of facilities for treatment	16
Stillbirth and neo-natal death	18
Caesarean section	18
Intercurrent diseases	19
The " Primary Avoidable Factor " ; standard adopted	19
Grouping of cases ; summary of findings	20
Tabular statement of second series of cases	21
Summary of findings in total cases investigated (first and second series)	
Tabular statement of total cases	22
Conclusions	24
Continuation of maternal death investigations ; Coroner's inquests ; inquiry by Public Health Departments	25

CHAPTER III.—FURTHER CONSIDERATIONS AS TO A MATERNITY SERVICE.

A comprehensive scheme not at present practicable ; essentials of a sound midwifery service	28
Summary of powers of Local Authorities as to maternity provision	28
Education of public opinion ; attitude of the expectant mother ...	30
Difficulties of effective propaganda ; teaching of hygiene ; notification of pregnancy	30

	PAGE
Ante-natal care ; arrangements between Local Authorities and general practitioners	32
Ante-natal clinics ; qualifications of Medical Officers	33
Consultant clinics	33
Post-natal care ; medical examination ; provision of facilities for treatment	33
Rôle of the midwife ; training and conditions of employment ...	34
Comparison with position in the Netherlands, Denmark and Sweden ...	34
Maternity nursing by midwives ; dangers of handywomen	34
Maternity nursing of cases attended by medical students	35
Organisation of midwifery work ; District Nursing Associations ; hospital districts	36
Rôle of the general practitioner ; limitation of operative work in domiciliary practice ; employment of general practitioners in maternity hospitals and clinics	37
Institutional treatment ; type of case needing hospital treatment ...	37
Extension of maternity accommodation ; association with general hospitals ; consideration of the needs of the medical student ...	39
Co-ordination of hospital and district services	39
Maternity hospitals ; general considerations	40
Provision for puerperal sepsis and puerperal pyrexia	40
Provision for abortion	40
Provision for emergency cases which are a potential source of sepsis	40
Size of a maternity unit ; medical staffing in varying types of institution ; availability of specialist medical staff	40
Anaesthetics and analgesics	42

CHAPTER IV.—STATISTICAL POINTS.

Variation in different countries in methods of recording and classifying maternal death	44
Memorandum by Registrar-General :	
Deaths included ; "exposed to risk" ; elements affecting comparability with other national statistics	44

CHAPTER V.—THE MATERNITY SERVICES OF THE NETHERLANDS, DENMARK, AND SWEDEN.

Visit of members of the Committee ; general observations	49
Acknowledgment of help given by foreign Medical Officers	51
Vital statistics	52
THE NETHERLANDS. Introductory	52
The midwife ; training	53
Maternity nursing	55
Employment of midwives	55
The medical practitioner ; training	56
The specialist	57
Hospitals	57
Ante-natal care	58
Anaesthetics	59

THE NETHERLANDS— <i>continued.</i>	PAGE
Physical condition of the people ; pelvic contraction	60
Pregnancy toxæmia	61
Comparison of maternal death rates in the Netherlands and England and Wales ; tables	61
Conclusions	64
DENMARK. Introductory	64
The rôle of the midwife ; training	65
The practice of the midwife	66
Midwife's procedure in abnormal cases	68
The rôle of the general practitioner ; training ; practice	69
Maternity Hospitals	70
Comparison of maternal death rate in Denmark and in England and Wales	73
Trend of mortality	73
Comparability of statistics	73
Conclusions	75
SWEDEN. Introductory	76
The rôle of the midwife	76
Training of midwives	77
The practice of midwives	79
Doctors ; training and employment	80
Anaesthetics and analgesics	81
Ante-natal care ; post-natal examination	81
Maternity Hospitals ; staffing... ..	82
Incidence of contracted pelvis ; comparison of measurements	83
Tables	84
Comparison of death rate in Sweden and in England and Wales	85
Tables	86
Conclusions	88

CHAPTER VI.—HIGH MATERNAL MORTALITY IN CERTAIN DISTRICTS OF ENGLAND AND WALES.

Statistical table	...	...	...	...	...	...	...	...	90
Inquiries by Medical Officers	...	...	...	...	...	...	...	...	91
Grouped maternal mortality figures ; table				...	...	...	...	...	91
Comparison of different types of area			...	...	...	...	...	...	92
Puerperal sepsis	...	...	...	...	...	...	...	...	93
“ Other causes ” of maternal death			...	...	...	...	...	...	93
General conditions associated with a high maternal mortality rate ; rural areas	...	...	...	...	...	...	...	...	95
Employment of married women			...	...	...	...	...	...	95
Housing	...	...	...	...	...	...	...	...	97
Unemployment and poverty			...	...	...	...	...	...	97
Rickets	...	...	...	...	...	...	...	...	98
Standard of health among young women	...		...	...	...	...	...	...	98

CHAPTER VII.—PUERPERAL SEPSIS.

Infection following normal labour; distribution of infection by streptococcus pyogenes; comparative risks in hospital and domiciliary practice	100
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	PAGE
Sources of infection ; streptococcus pyogenes	102
Throat carriers	103
Arrangements for investigation of epidemics	105
Infection by anaerobic streptococci	105
Preventive measures	106
The use of masks	107
The use of gloves	108
Other measures with reference to droplet infection... ..	109
Procedure as to throat carriers	109
Prevention of endogenous infection	110
Antisepsis in midwifery ; general considerations	110
Preparation of vulva and perineum	112
Bacteriological experiments	112
The use of iodine	114
Sterilisation of water and instruments ; choice of soap	114
Preparation of instruments	115
Preparation of hands and gloves	115
The use of lysol	117
Dietetic measures for the prevention of sepsis	117
Summary of research work ; centres ; investigations in progress	118
Puerperal fever ; Etiology	118
Pathology	119
Prevention	120
Treatment	120
Other fields of research ; glycerine treatment	120

CHAPTER VIII.—MATERNAL MORBIDITY.

Prevalence of maternal disability after childbirth	122
Effect of abnormalities of pregnancy and childbirth on maternal health	123
Toxaemias ; preventive measures	123
Pyelitis	125
Local septic infections ; cervical lacerations and cervicitis	125
Retroversion	126
Reproductive insanity	126
Effect of childbirth on pre-existing disease	127
Tuberculosis	127
Heart disease	128
Diabetes	129
Chronic nephritis	129
Chorea gravidarum ; epilepsy	130
Provision for treatment ; advice on contraceptive measures	130
The industrial employment of women in relation to maternal mortality and morbidity	131
Effect of work during pregnancy and the puerperium	131
Sickness benefit in pregnancy and the puerperium	132

CHAPTER IX.—CONCLUSIONS AND RECOMMENDATIONS.

General comments	134
Conclusions as to chief causes of maternal death and morbidity :	
Clinical	135
Administrative	136
Recommendations	137

APPENDICES.

	PAGE
1. England and Wales. Birth and Death Rates per 1,000 living ; Infantile Mortality rates ; and Mortality of Women in or associated with Childbirth per 1,000 Children born alive, 1911-31	142
2. Circular 1167. "Maternal Mortality." December 11th, 1930	143
3. Memorandum 156/M.C.W. "Maternity and Child Welfare." December 11th, 1930	144
4. Letter to Medical Officers of Health from Sir George Newman. "Bacteriological investigation with reference to puerperal sepsis." February 25th, 1932	149
5. Form suggested by the Committee for use by midwives in referring ante-natal cases to general practitioners	151
6. Registrar-General's Note (supplement to Chapter IV)	153

Departmental Committee on Maternal Mortality and Morbidity.

FINAL REPORT.

Lt.-Com. the Right Hon. Sir HILTON YOUNG, G.B.E.,
D.S.O., D.S.C., M.P., Minister of Health.

SIR,

We have the honour to submit herewith the Final Report of the Committee in response to the reference imposed by Mr. Chamberlain in June, 1928.

The Final Report is a record of the work of the Committee subsequent to the issue of the Interim Report in August, 1930. The Committee have been engaged on their task for four years, a period which may at first sight seem unduly protracted, but the inherent character of the Inquiry necessitated a prolonged survey of the subject if the causes of the current deaths in childbirth were to be explored. The work of the Committee has been primarily concerned with the continuance of their enquiries under the reference, together with certain supplementary issues which have arisen in its course. Attention has been paid, as promised in the Interim Report, to educational, statistical and research aspects of the problem, and the Committee's further observations on these matters are now submitted.

CHAPTER I.

INTRODUCTION.

The Committee's Interim Report was published in August, 1930, and it may be well briefly to summarise its general scope and conclusions.

The basis of the report was an investigation into the actual circumstances of a large number of maternal deaths, an inquiry not before attempted on so large a scale. The Committee appreciate the difficulties inherent in such an inquiry, both in the gathering of facts and the formulation of conclusions, but taken as a whole they are

satisfied that the hope that light would be thrown on the conditions under which midwifery is practised throughout the country has been justified. The Committee did not focus their attention primarily on the immediate cause of death: enumeration on this basis has been available in the Registrar-General's returns for many years past. What they set themselves to discover, if possible, was the underlying causes which set up the train of events to which death was ultimately due. This was a new method of research and the results appear to furnish a valuable contribution to our knowledge.

It was found that more than one factor was often concerned, but in many cases a definite defect in a reasonable standard of maternal care was clearly the starting point in the downward progress of the case. This defect was termed by the Committee "The Primary Avoidable Factor." The factors so estimated fell into four distinct groups. In one, there was omission or inadequacy of ante-natal care of the expectant mother; in another, a want of skill or sound judgment in the management of the case; in yet another, neglect by the patient or her friends to make reasonable preparation for the confinement, or even deliberate refusal to follow the advice of doctor or midwife; and in a final group, lack of provision of reasonable facilities for the proper treatment of a woman in childbirth, such as lack of skilled attendance, careful nursing, or hospital accommodation. On these grounds the Committee formed the considered opinion that reform was necessary in the education of the student in obstetrics, in the supervision of pregnancy, in the standard of medical practice, and in the completion of an effective maternity service.

The recommendations as to improved education in obstetrics of medical students were conveyed by the Minister of Health to the Lord President of the Privy Council, and by him to the General Medical Council, by whom they are now receiving careful consideration in consultation with the Licensing Bodies. The prompt action of the General Medical Council was indeed anticipated in view of the enlightened action of the Council in the reforms which they introduced in the new medical curriculum which the Council recommended in 1922, and it is satisfactory to the Committee that, as they understand, the Council and the licensing bodies recognise the necessity forthwith of still further strengthening the course of study in midwifery, particularly in its practical aspects, in the directions recommended by the Committee. One of the great obstacles to the full adoption of their recommendations is the difficulty of securing enough maternity cases for adequate practical instruction. The Committee attach great importance to this subject, and desire to emphasise the need for giving special and urgent consideration to facilities for medical education (a) when maternity hospital accommodation is being provided by local authorities or hospital governors, (b) in the allocation of beds for teaching purposes as between medical students and pupil midwives.

The Committee's recommendations as to an improved maternity service (covering supervision of pregnancy and improved medical practice) also received prompt official consideration in two

directions. First, the late Government took steps to suggest serious deliberation by the various bodies which might be concerned in the preparation of a comprehensive national maternity scheme on the lines suggested by the Royal Commission on National Health Insurance. The development of such proposals, which involved substantial new expenditure, has, however, of necessity been postponed by the present Government in view of the financial situation, and such postponement was announced in Parliament by the Minister of Health in April last. To the practical consequences of this decision we shall refer again. Secondly, the Minister of Health issued a circular and memorandum (Nos. 1,167 and 156 respectively, printed in the appendix herewith) to the 400 local authorities responsible for the adequate provision of maternal and child welfare services in their areas. The circular briefly summarised the conclusions and recommendations of our Interim Report, and urged that attention should be directed to them. The knowledge that a wider national scheme was under consideration no doubt acted as a deterrent, while the straitened financial position of certain authorities made further expenditure impracticable. Nevertheless out of the 400 authorities 183 submitted proposals for extension of their existing maternity services, and in many areas considerable provision on the lines of the circular had already been or were being made.

It is now inevitable that the comprehensive proposals of the Royal Commission must remain in abeyance, and in Chapter III of the present Report we have given special consideration to the improvement which may be secured without the heavy expenditure involved in a more elaborate scheme. It should be recognised that maternity services on a national basis have been in existence for some years, the principal defects being incompleteness, marked local variation, lack of co-ordination of the several parts and the absence of sufficiently close association between the general practitioner and the services provided by the Public Health Department.

Scope of Present Report.

This Final Report must obviously be concerned with matters supplementary to those dealt with in the Interim Report of 1930. In the first place, the Committee have continued the basic inquiry into cases of fatality in childbirth, partly to ensure that a sufficiently large and widely distributed body of data were available for reasonable and valid deductions, and partly to check the former conclusions at which they had arrived.

In the second place certain aspects of their reference were outstanding, particularly in regard to morbidity, puerperal sepsis, statistical aspects of maternal mortality in England and other countries, public education on its preventive side, need and direction of further research, and certain medical issues arising consequent upon the previous investigations of the Committee. A matter of paramount importance, and one to which inquiry has been specially directed, is that of the sources of infection and methods of prevention of puerperal sepsis, particularly where it follows normal

labour. The Committee's investigation revealed a large number of such cases, but only rarely was any exact information available as to the probable cause. Evidence on this subject has, however, been accumulating during the sitting of the Committee, and their considered opinion is presented in Chapter VII.

The principal body of new data which the Committee have had under review since they signed their Interim Report has been concerned with the further information collected as a result of 3,800 further reports on the causation of deaths, with some special field investigations carried out by several members of the Committee and some medical colleagues, in respect of maternal mortality in the Netherlands, Denmark and Sweden, and with the facts relating to certain high mortality districts in England and Wales.

Professor Miles Phillips (Professor of Midwifery in the University of Sheffield) and Dr. W. H. F. Oxley (visiting obstetrician to the East End Maternity Hospital), both members of the Committee, and Dr. James Young (Physician to the Edinburgh Royal Maternity and Simpson Memorial Hospital), a co-opted member of the Committee's Clinical Sub-Committee, visited the three European countries named, and Dame Janet Campbell (Senior Medical Officer for Maternity and Child Welfare at the Ministry of Health), a member of the Committee, Dr. Isabella Cameron (a Medical Officer of the Ministry), and Dr. Dilys Jones (a Medical Officer of the Welsh Board of Health) have visited a number of representative English and Welsh areas where the maternal mortality rate has for long periods been above the average. The principal findings of the latter investigations are included in the present Report, though it was deemed impracticable to incorporate in detail the large body of facts ascertained. These matters are discussed in the present Report.

CHAPTER II.

MATERNAL DEATH INVESTIGATION.

Reports on the circumstances of a number of maternal deaths have continued to be supplied to the Committee since the issue of the Interim Report, and have been analysed on the same lines as before by Mr. G. F. Gibberd and Mr. Arnold Walker.

The number of reports dealt with in the first series was 2,000, and in the second series 3,805, making a total of 5,805, and an analysis of the second series, together with a comparison of the two series and a summary of the total results, are given below.

The second series of 3,805 cases has been classified as in the first series.

CLASS I.—Deaths directly due to childbearing (including abortion and ectopic gestation), and comprising 3,059 cases.

CLASS II.—Deaths due to an independent disease, concurrent with pregnancy or childbirth, in which childbearing contributed to or accelerated death, or was merely present as an incident. In this group there are 746 cases.

CLASS I.—Death Directly Due to Childbearing.

First series, 1,596. Second series, 3,059.

These have been divided into the following sub-classes. Each death has been entered under one heading only:—

TABLE I.

Death directly due to childbearing.

	First Series.	Second Series.
1. Sepsis	616 (38·6%)	1,111 (36·3%)
2. Eclampsia	218 (13·6%)	326 (10·6%)
3. Operative Shock, etc.	145 (9·0%)	319 (10·4%)
4. Ante-partum Hæmorrhage	125 (7·8%)	248 (8·1%)
5. Post-partum Hæmorrhage	92 (5·7%)	204 (6·7%)
6. Other toxæmias, including chorea and mania	99 (6·2%)	180 (5·8%)
7. Embolism	113 (7·0%)	206 (6·8%)
8. Abortion	168 (10·5%)	410 (13·4%)
9. Extra-uterine Gestation	20 (1·2%)	55 (1·8%)

In their Interim Report the Committee drew attention to the fact that there was no great discrepancy between their own results and those of the Registrar-General with regard to the incidence of the various causes of death, and they considered that this was evidence that they had examined a fair sample of the maternal deaths in England and Wales, although they had been unable to collect complete returns.

The table now published shows a very striking correspondence between the two series, and the Committee feel that this supports their opinion that they have been able to survey the “average midwifery” of the country.

There is in the Second Series a slight increase in the proportion of deaths from abortion, but this does not necessarily imply an absolute increase in their number. The balancing decrease in other causes appears chiefly amongst the deaths from eclampsia and from sepsis, but even the latter is so small as to leave unchanged the fact that was stressed in the Interim Report—*i.e.*, the large part played by sepsis in contributing to the present-day mortality rate.

Following the general plan of discussion that was adopted in the Interim Report, the Committee have thought it useful to set out below their observations on the *Second Series* under similar headings.

1. *Sepsis.*

In dividing the total number of deaths from sepsis in the Second Series (1,111) into three classes—*viz.*, following normal labour (550), following low forceps delivery (117), following other abnormalities of labour (444)—emphasis is again laid on the large proportion of deaths from sepsis (50 per cent.) which follow upon a spontaneous delivery. It is clear that neither improvements in ante-natal work nor increased dexterity or judgment in obstetric operations will have any considerable effect upon this moiety of the fatalities, but that we must look for improvement in other directions. There is, unfortunately, no evidence to bring forward from the maternal mortality returns as to the probable sources of the infections which ultimately killed so many mothers. In very few cases has the bacteriology been investigated at all fully, nor have the methods of prophylaxis adopted been set out in detail. This question receives further consideration in Chapter VII.

In the Second Series the following clinical features observed do not differ markedly from those in the First Series. The day of onset of pyrexia was recorded in 966 cases, and in 63 per cent. of these it was observed within the first three days.

The duration of the illness was noted in 1,042 cases as under one week in 452, from one to two weeks in 280, and longer than two weeks in 310. The duration of labour was over 24 hours in 168 cases out of 656 in which a note was made on this point.

2. *Eclampsia.*

The total number of cases in this group was 326. In 162 cases the urine was tested regularly, but in 62 of these no albumin was found. In 100 albumin was found, but in 79 of these cases the treatment was definitely deficient. Thus we find that in 243 cases (74 per cent.) deficient ante-natal examination or inefficient ante-natal care was probably a big factor in the train of events that led up to the death of the patient. These findings correspond closely to those resulting from the examination of the reports in the First Series, where 70 per cent. came into this category. The Committee consider that this indifference to the potential dangers in cases of early toxæmia is due in part to the ignorance of the patient, but to some extent to the failure of the midwife or doctor to realise the risks involved, and they would emphasise again the need for

routine urine and blood-pressure tests throughout pregnancy. The impracticability of transferring a patient to hospital also plays a part in unsatisfactory treatment in some cases; but, while realising the difficulties, the Committee are more than ever convinced that no appreciable reduction in mortality from eclampsia will result until every case of toxæmia is given efficient treatment in a hospital (or its equivalent elsewhere) at the earliest moment after the detection of albumin in the urine or of a rise of blood-pressure. They think that the first step to the realisation of this ideal lies in a wider appreciation of its necessity. The importance of the part played by toxæmia in the causation of post-natal morbidity is referred to in Chapter VIII. of this report.

Of the 326 deaths in this group, 249 were cases of ante-partum and intra-partum eclampsia. The method of delivery was spontaneous in 84, in 50 by forceps, in 14 by Caesarean section, and in 12 by accouchement forcé. In 21 cases the method of delivery was unrecorded. Sixty-eight died undelivered. The remaining 77 were cases of post-partum eclampsia. Of the 326 cases of eclampsia, 164 (50 per cent.) occurred in primiparae. The Committee would again call attention to the danger of accouchement forcé as a method of treatment.

3. Shock.

Included in this group of 319 cases are, as in the First Series, a number of cases of somewhat obscure causation, where death occurred shortly after extensive obstetric interference. Some of these deaths were probably due to rupture of the uterus or other severe injury. Deaths apparently due to the immediate action of an anaesthetic are also included. The need for research in cases of obstetric shock not associated with such conditions is referred to in Chapter VII.

4. Ante-partum hæmorrhage.

There were 248 deaths from ante-partum hæmorrhage. These include only cases actually dying from hæmorrhage, not those dying from later complications.

TABLE II.

Placenta Praevia.

Total Number of Cases 150.

Method of Treatment.

Version	...	...	...	54
Version and vaginal plug...	...	...	...	3
Vaginal plug	...	...	...	27
Caesarean section	...	...	...	8
Accouchement forcé	...	...	...	13
De Ribes' bag	...	...	...	2
Scalp forceps	...	...	...	1
No active treatment	...	...	...	41
Unstated	...	...	...	1

TABLE III.

Accidental Haemorrhage.

Total Number of Cases 98.

Method of Treatment.

Vaginal plug	...	...	...	13
Version	...	...	...	11
Forceps delivery	...	...	...	4
Rupture of membranes	...	...	...	9
Caesarean section	...	...	...	8
Accouchement forcé	...	...	...	8
No active treatment	...	...	...	40
Unstated	...	...	...	5

In considering the Second Series the Committee are again strongly of opinion that some at least of the deaths from ante-

partum haemorrhage could have been avoided had the serious import of a first warning haemorrhage been realised, since the majority of the patients who died in their own homes had had previous warning of the impending danger some days or weeks beforehand. Had this been heeded they might have been placed in more suitable surroundings before the serious bleeding began.

5. *Post-partum Haemorrhage.*

There were 204 women who died directly from post-partum haemorrhage. The same absence of active measures to combat blood loss that was noted in the First Series is again apparent in this Second Series. Amongst these 204 cases, intravenous saline was given in 29 cases and rectal or subcutaneous salines in 43 cases. In 8 cases only was a blood transfusion given. In the remaining 124 cases no active attempts to make up the blood-volume were made.

In 125 out of the 204 cases the haemorrhage followed a normal first and second stage. The method of delivery of the placenta was as follows:—

Spontaneous in 109. Manual removal in 65. Undelivered in 17. Unstated, 13.

The Committee urge that the doctor's equipment for attending labour cannot be considered complete unless it includes the means for the immediate administration of intravenous or subcutaneous saline or gum-saline injections. Moreover, although it must often be impossible to give a blood-transfusion in an emergency in unsuitable surroundings, the proved value of this procedure is so great in cases of haemorrhage that the Committee feel that no efforts should be spared to increase the availability of this method of treatment.

6. *Other Toxæmias.*

This group, as in the First Series, includes deaths due to pregnancy albuminuria without fits (excluding chronic nephritis), hyperemesis gravidarum, delayed chloroform poisoning, mania and chorea. It comprises 180 cases in this Second Series.

7. *Embolism.*

With a total of 206 cases, many of doubtful diagnosis, this group is probably much too large, and, as in the First Series, no very definite conclusions can be drawn from it. Out of the 206 cases pyrexia was noted in 55, and venous thrombosis in 43.

8. *Deaths due to Extra-Uterine Gestation.*

There were 55 deaths reported under this heading.

9. *Deaths due to Abortion.*

The proportion of deaths due to abortion in the total 3,805 cases of the Second Series is slightly greater than in the First Series. The

total number of deaths attributed to this cause in the Second Series was 410, viz., 10·7 per cent. of the total or 13·4 per cent. of the 3,059 directly due to childbearing.

The Committee, in their Interim Report, gave special attention to the question of abortion and its part in maternal mortality, and in that Report the impracticability of determining numerically any actual increase in the incidence of abortion, and therefore of the case fatality from that cause, was referred to.

The Registrar-General's figures of deaths from abortion for 1929 and 1930 are now available, and are given below. They supplement those from 1926 to 1928 given in the Interim Report. It will be remembered that deaths from septicaemia following abortion were not differentiated from deaths from puerperal sepsis as a whole until 1926, and not until 1928 was a separate record made of deaths from abortion which had been the subject of a Coroner's enquiry.

	1928.	1929.	1930.
Total deaths from abortion	358	372	432
These comprise :—			
(a) Deaths from abortion, excluding (b), (included by Registrar-General in maternal deaths) ...	77	67	65
(b) Deaths from post-abortive sepsis (included by Registrar-General in maternal deaths) ...	224	238	300
(c) Deaths from abortion which were the subject of a Coroner's inquest (not included by Registrar-General in maternal deaths)	57	67	67

The proportion of deaths from abortion to total puerperal deaths (excluding (c)) for these three years is 11·9, and sepsis following abortion accounts for 21·2 per cent. of maternal deaths from puerperal sepsis.

The Registrar-General's figures show a rise of 21 per cent. in deaths from abortion during two years, and as there is probably no great change in the case fatality nor in the degree of exactitude in certification during that time, it would appear that there has been an increase in the actual number of cases, both fatal and non-fatal. Although this is disquieting, the deaths from this cause are far from assuming such a proportion as to justify the application to this country of the statement made in the monthly Epidemiological Report of the League of Nations (July, 1930) for Europe as a whole, that abortion is a greater cause of maternal death than is full-time confinement.

The investigations into the abortion cases showed a large number in which no skilled advice was sought until the woman was seriously ill or even moribund. This is no doubt due in part to the custom among women of considering a miscarriage as a matter of little consequence, and probably also in great measure to the desire to conceal an abortion which has been intentionally induced.

The Committee are impressed with the lack of facilities in many areas for the treatment of these cases in hospital. They are convinced, however, that an attempt to meet it by admitting cases of abortion, even though not manifestly suffering from sepsis, into maternity homes or wards may lead to serious danger to other

patients. They consider that cases of abortion should not be received into maternity hospitals or maternity homes unless separate accommodation and nursing staff is provided for them.

The causation of *stillbirth and neo-natal death* has not formed a direct part of this special investigation. It is too wide a question for general consideration in this Report, and does not come directly within the Committee's terms of reference, though it is closely related to the problem of maternal mortality and morbidity. There are some cases of stillbirth, particularly those dependent on developmental defects, of which the cause is still unknown. A large majority are, however, associated with difficult delivery or with pathological conditions in the mother, and there is great hope of diminution in the number of these by improved midwifery and better ante-natal care. In their Interim Report (page 64) the Committee commented on this matter, and referred to reports on special investigations which have been published by the Medical Research Council and the Ministry of Health.

The Operation of Caesarean Section.

There were 160 deaths reported under this heading. An analysis of these cases confirms the findings which were obtained from an examination of similar cases in the First Series. As before, the commonest indication for the operation was disproportion between foetus and pelvis, and the commonest cause of death was sepsis. In many of these cases the operation was done after previous attempts at delivery. Ante-natal examination revealing the probability of difficulty in delivery and enabling the operation to be done as a matter of choice, at a time and place arranged beforehand, would certainly have saved some lives in this group. On the other hand, the Committee's observations lead them to believe that in some cases there may be a tendency to resort to Caesarean section as treatment for complications of labour, perhaps without due consideration of other methods of obstetric treatment.

Caesarean Section.

TABLE IV.

Cause of Death.

Sepsis	...	...	...	...	72
Shock	...	...	...	...	18
Toxaemia	...	...	...	...	18
Pulmonary embolism	...	...	...	...	10
Pneumonia	...	...	...	...	5
Haemorrhage	...	...	...	...	18
Ileus	...	...	...	...	9
Tuberculosis	...	...	...	...	1
Chorea	...	...	...	...	1
Heart disease	...	...	...	...	8

TABLE V.

*Indication for Operation.**

Disproportion	...	...	...	84
Toxaemia	...	...	...	19
Placenta praevia	...	...	...	15
Pelvic tumour	...	...	...	5
Concealed accidental haemorrhage	...	...	...	8
Ruptured uterus	...	...	...	4
Obstructed labour	...	...	...	10
Heart disease	...	...	...	6
Other indications	...	...	...	9

* The discrepancy between the figures for placenta praevia and accidental haemorrhage in this table and those in Tables II and III above is accounted for by the fact that some of the cases where Caesarean section was performed on account of haemorrhage died later from sepsis, and so are not included in the section on haemorrhage.

CLASS II.—Deaths not Primarily Due to Pregnancy.

Out of a total of 3,805 deaths in the Second Series, there were 746 which were attributed to some intercurrent disease. This proportion agrees closely with that obtained from examination of the First Series (19·6 per cent. and 20 per cent. respectively). The Committee have again been impressed by the serious lack of facilities for treatment that have been evidenced from the study of the cases in this class, and they feel that although pregnancy and labour cannot be held entirely responsible for any of these deaths, yet more careful treatment of the incidental disease during pregnancy might have saved many lives. This applies with special force to institutional treatment during pregnancy in cases of heart disease. The causes of death in these 746 cases are set out in the table below:—

TABLE VI.

Incidental Deaths.

Lung disease (not tuberculosis) ...	...	...	209
Heart disease ...	...	...	189
Chronic renal disease ...	...	...	59
Pulmonary tuberculosis ...	...	...	57
Cerebral haemorrhage ...	...	...	26
Scarlet fever ...	...	...	5
Unclassified ...	...	...	201

THE “ PRIMARY AVOIDABLE FACTOR.”

In their Interim Report (Chapter II) the Committee discussed at length their attempt to find some numerical method of showing in what proportion of cases the maternal death was, in their view, preventable, and reference to that chapter is advised. Of course, the majority of deaths in childbed might be prevented could the course of pregnancy and labour be foreseen in all their details, and all adverse circumstances thereby forestalled; but to base deductions on such an impracticable hypothesis would have been of no value, and therefore the Committee in their Interim Report laid down an arbitrary standard of practical midwifery, against which they could test the events which were associated with each maternal death. The standard was defined in detail, and as it has been adhered to throughout the investigation of the deaths in the Second Series it is reproduced here.

(1) The patient should “ book ” and make arrangements for the confinement, should report any obvious deviation from the normal, and should carry out the instructions of the doctor or midwife.

(2) The patient should receive such ante-natal care from her doctor, midwife, hospital or clinic as should lead to the detection of albuminuria, malpresentation or marked disproportion between the foetal head and the mother’s pelvis. The examiner should obtain details of previous difficult labours and of serious illnesses.

(3) The confinement should not be undertaken in an entirely unsuitable environment.

(4) Such antiseptic and aseptic precautions as are generally recognised to be necessary should be taken.

(5) A doctor or midwife should be available, and should bring to the case a fair average degree of skill, knowledge and attention.

(6) Such hospital, consultant and transport services as are essential should be available, and the doctor should take advantage of them as and when necessary.

(7) A second doctor, acting as anaesthetist, should be obtained in severe cases.

(8) The hospital should provide suitable facilities and their officers show evidence of special skill.

If in any case one or more of these conditions were not satisfied, and a train of events ensued which resulted in the death of the mother, the first departure from the standard appeared to the Committee to be the point upon which attention should be focussed.

Such departure has been taken as the *Primary Avoidable Factor*, and the case classified accordingly.

	First Series.	Second Series.
Group 1.—Cases showing a primary avoidable factor ...	626	950
Group 2.—Cases in which no departure from established practice having a causal relationship to the death has been found	660	1,196
Group 3.—Cases not relevant to this part of the investigation (viz., abortion and extra-uterine gestation)	188	465
Group 4.—Cases in which the information was insufficient	122	448
Total	1,596	3,059

In other words, the Committee find as a result of enquiry into the second series of deaths that in 31 per cent. of the total number occurring as the direct result of childbirth the data available indicate a primary avoidable cause. When the “irrelevant” cases and the cases with insufficient information are excluded the net percentage of preventable deaths in this series is as high as 44 per cent.

Details of Groups 1 and 2 are given in the following table, which shows the nature of the Primary Avoidable Factors and the class of case in which they occurred. The preponderance of “lack or failure of ante-natal care” as a primary avoidable factor in deaths from eclampsia and of “error of judgment” in “sepsis, abnormal labour” is notable. The large number of cases showing no departure from established practice in death following normal labour would probably have been much reduced had fuller information been forthcoming.

TABLE VII.
Summary of the Findings in the Second Series.

—	No evi- dence of de- parture from estab- lished practice.	Lack or failure of ante- natal care.	Error of judg- ment.	Lack of facili- ties.	Negli- gence of patient.	Total.	Per- centage.
Sepsis, normal labour ...	399	—	34	11	14	458	21·3
Sepsis, low for- ceps ...	66	4	11	16	—	97	4·5
Sepsis, compli- cated labour...	156	83	106	16	22	383	17·8
Ante-partum haemorrhage...	58	16	82	—	30	186	8·7
Post-partum haemorrhage...	84	2	51	9	13	159	7·4
Shock ...	101	60	67	8	18	274	12·8
Eclampsia ...	80	120	53	—	33	286	13·3
Other toxaemias	95	9	22	2	16	144	6·7
Embolism ...	157	6	8	—	8	179	8·3
TOTAL ...	1,196	300	434	62	154	2,146	—
PERCENTAGE...	55·7	14·0	20·2	2·9	7·2	—	—

TABLE VIII.

Original Booking and Ultimate Delivery in the Second Series.

(Total Cases 3,805.)

		Sepsis (normal labour).	Sepsis (low forceps).	Sepsis (complicated labour).	Post-partum haemorrhage.	Ante-partum haemorrhage.	Operative Shock, etc.	Eclampsia.	Other Toxaemias.	Embolism.	Total.
Original Booking	Hospital ...	77	17	85	17	27	63	34	28	29	377
	Doctor ...	162	69	207	78	76	122	125	85	78	1,002
	Midwife ...	244	26	104	83	95	101	87	15	75	830
	Not booked ...	31	3	20	21	36	19	58	34	15	237
	Unstated ...	36	2	28	5	14	14	22	18	9	148
	TOTAL ...	550	117	444	204	248	319	326	180	206	2,594
Ultimate Delivery	Hospital B *	75	17	85	17	26	63	32	28	29	372
	„ E...	12	2	126	32	110	96	131	69	15	593
	Doctor ...	189	98	202	116	67	134	89	48	97	1,040
	Midwife ...	234	—	23	31	—	13	22	1	55	379
	Undelivered	—	—	—	—	37	7	47	25	1	117
	Unstated ...	31	—	4	2	6	6	4	8	7	68
	No attendant†	9	—	4	6	2	—	1	1	2	25
TOTAL ...		550	117	444	204	248	319	326	180	206	2,594

In addition to the above, the following have been reviewed, but not included in the above table.

Deaths due to abortion	...	...	...	...	...	410
Deaths due to Ectopic Gestation	...	...	...	...	...	55
Cases in which pregnancy or labour merely accelerated death in a patient seriously ill with some intercurrent disease	...	...	...	...	...	746
TOTAL	...	...	...	...	...	1,211

Combined Results of the Two Series.

The results of the two Series together are as follows:—The Committee have investigated 5,805 maternal deaths, 4,655 of which were directly due to childbearing, and 1,150 were due to intercurrent disease.

* B = booked case. E = Emergency case.

† This means that no preparation had been made for the confinement, and that no doctor or midwife was present during labour. It does not include cases born before the arrival of the attendant.

The causes of death in the 4,655 directly due to childbearing were as follows :—

Sepsis	...	...	...	...	1,727	37.1 per cent.
Eclampsia	...	...	...	...	544	11.6 „ „
Operative shock, etc.	...	...	...	...	464	9.9 „ „
Ante-partum haemorrhage	...	...	...	...	373	8.0 „ „
Post-partum haemorrhage	...	...	...	...	296	6.3 „ „
Other toxaemias, including chorea and mania	...	...	...	...	279	6.0 „ „
Embolism	...	...	...	...	319	6.8 „ „
Abortion	...	...	...	...	578	12.4 „ „
Extra-uterine gestation	...	...	...	...	75	1.6 „ „

The results of the search for a primary avoidable factor show :—

Group 1.—Cases showing a primary avoidable factor ... 1,576

Group 2.—Cases in which no departure from established practice having a causal relationship to the death has been found ... 1,856

Group 3.—Cases not strictly relevant to this part of the investigation, viz.: abortion and extra-uterine gestation ... 653

Group 4.—Cases in which the information was insufficient 570

TOTAL ... 4,655

If the cases not relevant to this portion of the enquiry and those in which the information was not considered sufficient to warrant a definite conclusion are deducted, the percentage showing a primary avoidable factor is 45.9.

TABLE IX.
Primary Avoidable Factor.
(Total of First and Second Series.)

—	No evidence of departure from established practice.	Lack or failure of ante-natal care.	Error of judgment.	Lack of facilities.	Negligence of patient.	Total.	Percentage.
Sepsis, normal labour ...	608	1	61	35	26	731	21.3
Sepsis, low forceps ...	99	5	13	26	—	143	4.1
Sepsis, complicated labour	254	150	163	31	35	633	18.4
Ante-partum haemorrhage	84	21	113	1	52	271	7.8
Post-partum haemorrhage	138	9	71	15	33	266	7.7
Shock ...	145	103	95	15	26	384	11.1
Eclampsia ...	134	210	93	1	56	494	14.4
Other toxaemias	145	17	38	2	23	225	6.5
Embolism ...	249	10	11	—	15	285	8.3
TOTAL ...	1,856	526	658	126	266	3,432	—
PERCENTAGE...	54	15.3	19.1	3.7	7.7	—	—

It will be noted that a primary avoidable factor was found in 59 per cent. of the cases dying from sepsis following complicated labour, and in as many as 73 per cent. of the cases dying from eclampsia. The inference is either that our standard of midwifery practice is not high enough, or else that our knowledge of the best methods of treatment in these cases is still inadequate.

TABLE X.
Original Booking and Ultimate Delivery.

		Sepsis.	Post-partum Haemorrhage.	Ante-partum Haemorrhage.	Operative Shock, etc.	Eclampsia.	Other Toxaemias.	Embolism.	Total.
Original Booking.	Hospital ...	253	22	38	90	57	41	50	551
	Doctor ...	654	117	107	180	197	110	115	1,480
	Midwife ...	616	117	144	140	151	23	109	1,300
	Not booked ...	111	33	62	29	102	55	28	420
	Unstated ...	93	7	22	25	37	50	17	251
	TOTAL ...	1,727	296	373	464	544	279	319	4,002
Ultimate Delivery.	Hospital B * ...	256	23	39	91	55	41	50	555
	„ E ...	204	41	175	141	220	101	27	909
	Doctor ...	767	178	104	193	149	63	141	1,595
	Midwife ...	415	42	—	20	29	5	80	591
	Undelivered ...	—	—	47	9	86	34	2	178
	Not stated ...	64	3	6	10	4	34	14	135
	No attendant† ...	21	9	2	—	1	1	5	39
	TOTAL ...	1,727	296	373	464	544	279	319	4,002

Summary of the Conclusions drawn from the Investigation into Maternal Deaths.

By the co-operation of Public Health Officers, doctors and midwives, and by the use of the existing machinery of the Ministry of Health throughout England and Wales, the Committee have been able to review in detail the history of 5,805 deaths due to or associated with childbirth—a wider and more complete field of midwifery than has ever before been investigated.

These have been taken in two series, the first of 2,000 and the second of 3,805 cases. In each the investigation has been carried out in precisely the same way, and the results have shown a remark-

* B=Booked case.

E=Emergency case.

† This means that no preparation had been made for the confinement, and that no doctor or midwife was present during labour. It does not include cases born before the arrival of the attendant.

ably close correspondence throughout. The results of the First Series are set out in detail in the Interim Report, and the Committee have thought it unnecessary to repeat them in addition to summarising the total results. They feel that the continuance of this laborious work has been justified in two ways—firstly, in that their original observations are substantially confirmed, and, secondly, in that it has satisfied them that the particular method of investigation which they adopted is not likely to yield further information of value for the Committee's enquiry.

The search for the "Primary Avoidable Factor" has enabled the Committee to assess numerically the influence of departure from a standard of midwifery practice which should be readily attainable in this country. Although their information was incomplete in some respects, they were able, with a reasonable approach to certainty, to draw the broad conclusion that *at least one-half of the maternal deaths occurring in this country were preventable.*

The Committee stated in the Interim Report their opinion that had the information contained in the reports been fuller and more exhaustive this number would probably have been higher. This belief is supported by a report just published by Professor Munro Kerr on maternity deaths occurring in the Glasgow Maternity Hospital for the years 1926-30,* in which he takes the Committee's "Primary Avoidable Factor" as the basis of his investigation. The result shows 75·1 per cent. of deaths probably preventable as compared with 45·9 in the Committee's total series, and this surprisingly high figure is no doubt due, at least in part, to the fuller knowledge and more accurate information possible where hospital records are available for all the cases under consideration.

Continuance of Maternal Death Investigations.

The question as to continuation of special enquiries into maternal deaths is one which has received the attention of the Committee, and was briefly referred to in their Interim Report (page 109). They have been impressed with the value of the investigations which have been carried out under their auspices, which have undoubtedly encouraged detailed consideration of the causes at work and have stimulated general interest in the problem and in the adequacy of provision for maternal care. The enquiries have, moreover, in many cases been of value to practitioners, particularly when the investigation has been made by an obstetric specialist.

The primary source of our knowledge as to mortality from any given cause is medical certification of death, as summarised and presented to the public by the Registrar General. This information, however, is purely statistical, and the need for more detailed information in individual cases was the first point which confronted the Maternal Mortality Committee at the outset of their work. Moreover, for several years before the Committee was appointed the

* An investigation into the Mortality in Maternity Hospitals, by J. M. Munro Kerr, M.D. Glasgow, F.C.O.G., and Hector R. MacLennan, M.B. Glasgow.—"Lancet," 19th March, 1932.

Medical Officers of Health of certain local authorities had already been engaged in such inquiries with the co-operation of many practitioners in their area. The practical importance of the information thus obtained was well illustrated in one county, where inquiries revealed a large proportion of deaths in which there had been no ante-natal care, and a large proportion in which the patient had no nursing care until her death except that afforded by a handywoman.

The opinion has been expressed recently by various bodies and individuals that the holding of a compulsory inquest or post-mortem examination, or both, in all cases of maternal death would be a useful measure in the interests of maternal safety. The Midwives' Institute placed these points before the Committee in their evidence, when they suggested that "a compulsory post-mortem examination in every death in childbirth would assist the knowledge of the reason of the death, and in some cases might result in a different death certificate being given." The Minister of Health also has been approached by several social and political bodies with the request to take early and definite action in this direction, and the question was referred by him to the Committee for their consideration. The Committee invited an expression of opinion from the Medical Officers of Health who have served on their special Sub-Committees, and the replies were generally unfavourable to the proposal and indicated the belief that the advantage likely to accrue would not justify the introduction of special legislation.

The Committee recognise that in any particular death it is for the Coroner to decide whether an inquest should be held and that under certain circumstances this is a proper method of investigation. They consider, however, that as a routine in cases presenting no special features an inquiry such as that now carried out by Medical Officers of Health is preferable to an inquiry in a Coroner's Court. The main argument in favour of the holding of an inquest or post-mortem examination in every case is that this procedure would lead to more accurate certification of the cause of death and to increased knowledge of the pathological conditions involved. It appears, however, to the Committee that a further consideration in the minds of some of the supporters of the proposal is that it would enable culpability to be apportioned where it is due, and so would stimulate a better standard of midwifery practice and ante-natal care. The Committee hold that only rarely would a formal inquiry and a post-mortem examination elicit information as to the appropriateness of the treatment adopted or as to the skill and judgment of the attendant, on which a decision of a lay jury might reasonably be based. Such findings would often be open to doubt, and might give rise to much inexpert and ill-advised criticism, not only in Court, but in the public Press. There might well follow the creation of prejudice, perhaps quite unjust, against an individual, the possible abandonment of the practice of midwifery by precisely those conscientious and sensitive doctors and midwives from whom the best type of practice might be expected, and the creation of serious alarm among expectant mothers.

Moreover, the holding of a post-mortem examination, and particularly of a formal inquest, in cases presenting no special features calling for such inquiry, would be bitterly resented in many cases by the patient's relatives, especially as a Coroner's inquest is associated in the public mind with unnatural deaths from unknown causes.

There appears reason to believe that cases of gross negligence and of suspected criminal abortion are usually reported to the Coroner under existing conditions. There are, no doubt, deaths following intentionally induced abortion in which abortion is not suspected as a factor, or is not mentioned as a contributory cause of death, but the detection of such cases would obviously not be facilitated by routine inquests on cases certified as due to abortion.

The Committee advise, therefore, that the Minister should take appropriate steps to encourage local authorities to continue inquiries into maternal deaths as part of the routine work of a Public Health Department, the confidential character of the reports being maintained and a simplified form of inquiry being used. These inquiries would continue to throw light on local problems of maternal mortality, and to indicate the direction in which improvements in the maternity services are needed. The reports might suitably be forwarded to the Chief Medical Officer of the Ministry of Health for such general investigation as may be found desirable.

CHAPTER III.

FURTHER CONSIDERATIONS AS TO MATERNITY SERVICES.

The recommendations as to betterment of the provision for maternal care throughout the country, which were the result of the Committee's earlier deliberations, were summed up in their Interim Report (August, 1930) in the form of suggestions for an improved maternity service, which should expand, supplement and co-ordinate the services already provided by local authorities, voluntary bodies, and private medical practitioners and midwives. The general outlines of such a scheme were accepted by the late Government, and preliminary steps were taken to give them practical effect. Since then, however, it has become evident that the financial position of the country precludes substantial expenditure for this purpose.

The Committee have, therefore, given renewed consideration to the best means of improving the existing services without comprehensive re-organisation on the lines originally considered by them. Such a revision connotes no departure from the principles laid down as to the essentials of a sound midwifery service. These essentials were formulated in the Interim Report (page 92) as:—

- (1) The provision in every case of the services of a registered midwife to act either as midwife or as maternity nurse.
- (2) The provision of a doctor to carry out ante-natal and post-natal examination in every case, and to attend as may prove necessary, during pregnancy, labour and the puerperium, all cases showing any abnormality.
- (3) The provision of a consultant, when desired by the doctor in attendance, during pregnancy, labour and the puerperium.
- (4) The provision of hospital beds for such cases as need institutional care.
- (5) The provision of certain ancillary services.

Provision for many aspects of maternal care is within the existing powers of local authorities under the Midwives Acts, the Notification of Births (Extension) Act, 1915, and the Maternity and Child Welfare Act, 1918, and the services which they are authorised to provide for this purpose may be briefly enumerated.

Midwifery.

Provision of midwives by salary or by subsidy.

Provision of transport, telephone and equipment.

Payment of midwife's fee in necessitous cases.

Payment of doctors called to the assistance of a midwife. (This is a statutory obligation under the Midwives Act, 1918.)

Compensation of a midwife when suspended from practice on account of infection, not being herself in default. (This is a statutory obligation under the Midwives and Maternity Homes Act, 1926.)

Compensation of midwives for loss of cases sent to a maternity hospital from an ante-natal clinic.

Provision of post-certificate courses of instruction.

Provision of midwives to act as maternity nurses.

Provision of home nursing for puerperal fever and ophthalmia neonatorum.

Provision of home helps.

Institutional Provision for Maternity.

Provision of beds for cases of abnormal midwifery and abnormal ante-natal conditions, and for patients whose domestic circumstances are unsuitable for delivery at home; beds for the treatment of puerperal fever and ophthalmia neonatorum; also homes for unmarried mothers and their infants, and for convalescent treatment, and beds in association with clinics for restoration of lactation.

Ante-natal Provision.

Provision of ante-natal clinics, ante-natal examination by a general medical practitioner, health visiting, dental treatment, extra nourishment.

Post-natal Provision.

Provision of clinics for medical examination, clinics for promotion of breast feeding, extra nourishment.

Consultant Services.

Provision of consultants for abnormal ante-natal conditions, for difficult labour and for puerperal fever.

Other Services.

Bacteriological examination, X-ray examination, provision of outfits ((a) sterilised midwifery outfits, (b) clean linen, etc.), provision of anti-streptococcic serum.

Health Instruction.

Literature for distribution, provision of exhibitions, lectures, lantern slides, films.

It is to be noted that where these services are provided by the Local Authority the mother is expected (with a few exceptions, which include ante and post-natal clinics and educational services) to contribute according to her means.

Such services are provided to some extent, though with great variation in scope and efficiency, in practically all areas in the

country, and a further development has taken place in response to the Circular* issued by the Ministry of Health after the Committee's Interim Report, although in many areas schemes involving increased expenditure are being postponed for the present on financial grounds. Much, however, remains to be done before the essentials of a complete midwifery service are available for every mother.

The Education of Public Opinion.

Before giving consideration to these points, the Committee desire again to draw special attention to the necessity, emphasised also in their earlier report, of educating the expectant mother to take advantage of the services provided for her. The Committee's enquiries show clearly that the mental attitude of the mother herself, not only towards ante-natal care, but throughout childbirth and the lying-in period, is a factor of the greatest importance.

We find that many women, even in their first pregnancy, do not submit themselves to any supervision at all, and in subsequent pregnancies this neglect is still more marked, as they have the feeling that their experience renders it unnecessary. But in point of fact, there are many risks special to the older woman, and great need for competent advice throughout later pregnancies. Dr. Leyland Robinson has recently called attention to the increased danger in such pregnancies arising out of the bodily changes set up by repeated childbearing and the physical declension due to advancing age.† Instruction and encouragement in the matter are needed by primipara and multipara alike.

A vigorous campaign for the improvement of maternity services is handicapped by the difficulty of making statements which are sufficiently arresting to attract general attention and at the same time avoid over-emphasis of the difficulties and dangers of childbearing which might create exaggerated anxiety in future mothers. It is essential that women should realise that pregnancy is a serious business which they should not be expected to face without the advice and support of both doctor and midwife; that while it is a personal matter and not a subject for gossip or outside comment, it is important for them to seek confidential and competent advice at the very beginning, partly as an insurance against a possible though remote risk, but mainly because many discomforts and disabilities which often accompany pregnancy can be overcome or avoided by experienced counsel; and, similarly, that the pain and the hazard of childbirth itself can be reduced to a minimum by the attention of a doctor or midwife already familiar with the patient and understanding her mental as well as her physical condition. Until every woman accepts this continued supervision as a matter of course and because she finds it advantageous to do so, she will never make full use of such facilities as are offered. We must not try to frighten her into doing this by holding up the bogey of possible

* Circular M.C.W. 1167 and Memorandum 156. December, 1930. (See Appendix.)

† "The Old Multipara." A. Leyland Robinson, M.D.Lond., F.R.C.S.—B.M.J., 12th July, 1930.

dangers or by over-emphasising maternal mortality and saying too little about healthy, normal motherhood. Nor should our admonitions be addressed to the woman alone. When the husband, relatives, friends—in fact, the general public—understand that the pregnant woman requires more skilled advice than can be obtained in her own family or drawn from her own experience, the steady pressure of common sense, public opinion and fashion will eventually induce her to turn to her doctor or midwife for early and continued supervision because everyone takes it for granted that she should. This is the outlook we must strive to cultivate, but time and habit are necessary to create such a state of mind, and the immediate problem is the best method of organising effective propaganda by health talks, individual instruction, fathers' committees, films, and perhaps to some extent even by wireless; the services of health associations or societies such as Women's Institutes and Guilds, who are willing to undertake the instruction of their own members, should also be enlisted. In this educational effort the most important part should be played by the personal guidance of the doctor, the midwife and the health visitor, and special attention might well be paid in the training of the midwife and her post-certificate instruction to her responsibility in this matter.

Neither should it be forgotten that the best advertisement for ante-natal care, and one which will probably accomplish more than mere *ad hoc* propaganda, is the successful outcome of maternity cases that have received ante-natal supervision by midwife or doctor. On the other hand, an unfavourable outcome for mother or child may do very much to bring ante-natal care into undeserved disrepute. For these amongst other reasons it is essential that the ante-natal care should reach the highest possible standard of excellence and that no slipshod work should be allowed to pass muster by either midwives or doctors.

Besides the general instruction of the adult population, much might be done to prepare the girl for marriage and motherhood by suitable teaching during school life and adolescence. As long ago as 1910 the Board of Education issued a Memorandum encouraging the teaching of mothercraft to the elder girls at public elementary schools as part of the instruction in hygiene, by means of simple lessons in infant care and management—a subject with which many of these girls are already familiar in a practical way in their own homes. Such teaching might be given in secondary schools, continuation schools, girls' clubs, and through industrial welfare organisations, and instruction in personal hygiene, including the need for outdoor exercise, sufficient sleep and suitable dietary should form part of such teaching.

The institution of a system of *voluntary notification of pregnancy* has been suggested as the most effective method of bringing the expectant mother into touch with the opportunities for advice or treatment available in the district. Such a system has been established since 1916 in the County Borough of Huddersfield, and between 40 and 50 per cent. of pregnancies are now notified to the Public Health Department by doctors or midwives with the explicit

consent of the patient. The Committee are not, however, prepared to urge such a system for general adoption, as they believe that educational measures such as those referred to above will ultimately be more effectual. Moreover, it appears probable that the women who are prepared to allow the pregnancy to be notified are, as a rule, those who would in any case take steps to obtain help and advice.

Ante-Natal Care.

The arrangements whereby ante-natal care can best be brought by local authorities within reach of all expectant mothers were the subject of special consideration in the earlier Report, and the advantages were set forth of supplementing the work of ante-natal clinics by some plan for enlisting the help of the general practitioner for ante-natal examination in certain cases. It was hoped by this means to overcome the reluctance of many women to disclose the fact that they are pregnant, or to consult doctors unfamiliar to them, and also to meet the needs of sparsely populated areas where it is impracticable to provide clinics within easy reach. Moreover, the value of associating the general practitioner during the ante-natal period with a patient to whom he would be called by the midwife in case of abnormality is undisputed, and the proposal meets the difficulty (existent in most localities) of employing a general practitioner as medical officer of an ante-natal clinic where he would have to examine and advise the patients of his colleagues.

The Ministry of Health supported this view in their Memorandum 156, issued to Local Authorities in December, 1930, and authorised the payment of fees to practitioners for the routine examination, either at the woman's home or at the doctor's surgery, of pregnant women who have engaged a midwife for their confinement, and who are not insured under the National Health Insurance Acts. This was a valuable addition to the arrangement already obligatory under the Midwives Acts for the Local Supervising Authority to pay a doctor called by a midwife to a case recognised by her as abnormal.

Between twenty and thirty Local Authorities, including the County Councils of Cumberland and Hampshire, have already made agreements with general practitioners on these lines, but other Authorities which have had similar proposals under consideration have been obliged to delay them owing to the increased expenditure which they estimate would be involved. The Committee believe that the remuneration required for the routine examinations advised by them would not be large, and as the proposal is confined to uninsured women who have engaged a midwife and are unable or unwilling to attend an ante-natal clinic, its total cost should not be great. In view of the importance of the matter, the Committee recommend that earnest consideration should be given by Local Authorities to this method of obtaining earlier and closer contact between doctor and expectant mother.

If such arrangements are made, it is important that steps should be taken to secure that the proposed examinations are not perfunctory, and that a suitable record, preferably on a uniform basis,

is kept and is available for use at the confinement and in future pregnancies. It appeared to the Committee that such medical records might conveniently be kept on an ante-natal form such as that printed in the Appendix to this Report.

With regard to *ante-natal clinics*, their conduct and scope was one of the first subjects considered by the Committee, and a Memorandum on the matter was issued by the Ministry on their recommendation in 1929.* Some 860 such clinics are now provided by Local Authorities, and there are also about 190 conducted by voluntary hospitals or associations and co-ordinated with the work of the Public Health Departments. The Committee have already expressed their appreciation of the valuable work, both clinical and educational, carried out at some of these clinics, but they desire to emphasise again the failure in efficiency which may occur, and which indeed is at times inevitable, when advice is given by a Medical Officer who lacks special experience and is out of touch with the actual practice of obstetrics. They recommend that special efforts should be made to secure the appointment to ante-natal clinics of Medical Officers trained and experienced in obstetrics, including ante-natal work, preferably those who have held a resident post in a maternity hospital. Attendance at post-graduate courses of instruction should be encouraged with a view to keeping knowledge and practice up-to-date.

The establishment in one or two larger centres in the district of a consultant clinic staffed by a specialist, to which patients can be referred from the ordinary clinics or by general practitioners, is a measure which has already proved its value to both patient and practitioner in some areas.

Post-natal care has so far received little attention, yet the position as to maternal disease and disability following childbirth discussed in Chapter VIII reveals its importance, and shows that a systematic and thorough medical examination of every patient from two to six weeks after confinement would enable many of these conditions to be detected and remedied at an early stage. In addition to a careful survey of local conditions, a general examination of heart, lungs, renal function, and nervous system will be called for where there have been previous complications of this nature, many of which there may be some tendency to discount and disregard once the immediate risks of childbirth have been overcome.

The first desideratum is clearly to prevent these morbid sequelae, and the measures necessary to this end are one with those directed to a better standard of maternal care which have already been considered by the Committee in connection with their main problem. For alleviation and cure, however, there can be no question of the value of systematic examination on the lines suggested, supplemented by the provision of adequate facilities for treatment which are, in the Committee's opinion, an essential part of a complete service for the care of the mother. They are impressed with the

* Maternal Mortality and Childbirth. Ante-Natal Clinics: Their Conduct and Scope.—Memorandum 145, M.C.W., 1929.

lack of such facilities in many districts, particularly in those areas not served by a hospital with a special gynaecological department. They suggest that the Public Assistance Hospitals now taken over by the local authorities might, in some cases, give valuable service of this kind if a gynaecologist were appointed to the medical staff.

The Rôle of the Midwife.

In relation to the problem which has been engaging the attention of the Committee, there is no more important matter than the provision of an *adequate service of trained midwives* to act both as midwives and as maternity nurses working with doctors.

The status and conditions of employment of midwives in the Netherlands, Sweden and Denmark described in Chapter IV are of interest in this connection. In these countries the number of midwives trained each year is strictly limited, and the opportunities for instruction are reserved for women who intend to practise as midwives and not wasted, as too often in England, in the training of women who have no intention of taking up midwifery work.*

The concentration of midwifery training in one or two large institutions as in these countries appears to the Committee to give greater opportunity of a high and uniform standard of instruction compared with the multiple small training institutions approved for the purpose in England. The training is also longer and more thorough than in England. The status of the midwives is higher, and the employment of midwives by all classes of society a long-standing custom. The conditions of work are regulated by the Local Authority, relief duty is provided for, pensions arranged and fees paid either as whole-time salary or part-time subsidy. The midwife's position is so stabilised that doctors attend in order to give an anaesthetic, while she remains responsible for the delivery, and in the Netherlands nurses either partly or fully trained undertake the nursing during the puerperium under the direction of the midwives. Notwithstanding this high status, the responsibility of the midwives (with exceptions in outlying parts of Sweden) is directly limited as in England to normal cases, and they are not allowed to give opiates or other drugs except ergot.

The Committee are satisfied that extension of the employment of midwives in normal cases in this country is an essential condition of a satisfactory service, and they consider that as midwives become better instructed in the matter of ante-natal care the routine supervision of pregnancy, subject to the medical examination during that period, may with advantage be increasingly entrusted to them. Moreover, they are strongly of opinion for many reasons, but particularly in view of their observations in Chapter VII as to the importance of a careful technique in the antiseptic precautions to be taken in the preparation and toilet of the patient, not only before and during delivery, but throughout the lying-in period, that the practice of attendance at confinement by *a doctor accompanied by*

* Ref. Report on the work of the Central Midwives' Board. 1931. Published by H.M. Stationery Office.

an untrained "handywoman" does not afford a reasonable degree of security from septic infection even in normal cases, much less when any operative procedure has to be undertaken.

In this connection an important point has arisen in districts served by medical schools. There is no doubt that in the past, although the records of districts attached to teaching hospitals have shown admirable clinical results, there has been in many cases failure to provide for the due nursing of the patients, the hospitals having too often acquiesced in the use of untrained handywomen. It appears to the Committee that provision of skilled maternity nursing by hospitals, or by municipal bodies in co-operation with the hospital districts providing medical attendance, as is now done in several instances, would be greatly to the immediate benefit of patients, and would undoubtedly serve their ultimate interests by assisting in the training of a body of medical practitioners and midwives skilled in the practice of obstetrics.

The effect of skilled maternity nursing in district midwifery has been demonstrated as regards the incidence of puerperal pyrexia in a paper recently published in the "*Lancet*"*, giving an analysis of charts of patients delivered in the University College Hospital district before and since the introduction of a system of nursing of every patient by a fully-trained nurse midwife under the supervision of an experienced midwifery sister. The analysis, which covers 1,696 cases, shows that among 679 cases delivered by the students where skilled nursing was not provided as a routine, 5·2 per cent. showed notifiable puerperal pyrexia, whereas among 730 students' cases for whom skilled nursing was provided, the percentage was 2·19. Moreover, 118 cases delivered by pupil midwives before the institution of a sister to supervise the maternity nursing carried out by them showed 4·23 per cent. of notifiable pyrexia, against 1·18 per cent. among 169 cases afterwards.

The Committee have not considered in detail points relative to the training and supply of midwives, as this was the subject of a separate enquiry by a Departmental Committee, which reported to the Minister in 1929. They desire, however, to associate themselves with the recommendations of that Committee, particularly as to the need for more thorough instruction in ante-natal care and nursing technique, and as to the desirability of a preliminary test of elementary education. They desire also to express the opinion based on their enquiries that a higher all-round standard of training is greatly needed. Further, they wish strongly to support the recommendation in paragraph 24, page 73, of the Midwives Committee Report,† viz. :—

(a) "That the present system of certification should be altered so that in future every pupil midwife would be required after passing the examination to undergo a period of three months' post-examination experience under supervision, during which she would be made personally responsible for the conduct of labour in not less than five cases. There-

* The Domiciliary Service of a Maternity Hospital, by Gladys B. Carter, B.Sc. (Econ.), S.R.N. *Lancet*, Jan. 2nd, 1932.

† Report of Departmental Committee on the Training and Employment of Midwives. 1929.

after she would be eligible to have her name placed on the Roll of the Central Midwives Board, and be fully licensed for independent practice."

(b) "That the post-examination experience should be undertaken immediately after the passing of the examination, or within such period thereafter, not exceeding six months, as would ensure that it constituted the final stage of training and an introduction to the individual responsibility of independent practice."

(c) "That midwives whilst obtaining the post-examination experience should be expected to assume the full responsibility appropriate to their calling, and that this end would best be achieved by making arrangements for them to be appointed as members of the staff of small maternity institutions specially recognised for the purpose, or as assistants to competent and experienced independent midwives specially approved for the same end; and that the onus of providing suitable openings for post-examination experience would fall on the training schools."

They also agree as to the great importance of courses of post-certificate instruction for practising midwives, and endorse the recommendation of the Midwives Committee Report, page 74:—

"That post-certificate training, the present facilities for which are extremely limited, should be encouraged and arranged for midwives at regular intervals by all Local Supervising Authorities, and that the cost incurred in this relation should be borne by the Local Supervising Authority concerned."

As regards the midwife's status and conditions of work, the Committee are in full sympathy with the observations made in the Departmental Committee's Report as to adequate remuneration, limitation of number of cases, pensions scheme, arrangement for relief duty, age of retirement, etc. The present position differs greatly in town and country. In the rural districts organisation of the midwifery service has been necessitated by the conditions to be met, and the efforts of County Nursing Associations, with substantial help from county councils and the Ministry of Health, have brought an admirable service within the reach of over 80 per cent. of the population. In this group fairly stable conditions have been secured for the district nurse-midwife which approximate to those found in Denmark and Sweden. The pay, though not high, is fixed and guaranteed; cottage or lodgings and equipment are provided; substitutes are arranged for holidays and sickness, and in many areas there is a superannuation scheme. In the urban districts and towns, on the other hand, though Nursing Associations, hospitals and municipal midwifery contribute their share, the bulk of the work is in the hands of independent midwives of very varying education and capacity, including many who do only part-time work. A few have financially successful practices; many do good work under depressing and difficult conditions. In the Committee's opinion the best hope of securing a radical improvement in the midwife's position, remuneration and conditions, as well as facilitating a sustained high standard of practice, lies in the direction of increased local organisation, whether by Nursing Associations, hospitals or Local Authorities. The admirable work done over a long series of years by midwives employed by such Associations as Plaistow Maternity Charity, the East End Maternity Hospital, the Associations affiliated to the Queen's Institute for District Nursing, and many others, suggests that the skill and the sense of responsi-

bility and vocation of the midwife are in no way diminished by such organisation, while her material and professional gain is great. In the attaining of such results the Committee attach great importance to supervision by highly skilled and sympathetic superintendent midwives, themselves part of the service.

The Rôle of the General Practitioner.

Reduction in the group of deaths following abnormal labour will be effected only when general practitioners realise that the surroundings of the ordinary working-class home are not suitable for the performance—often without adequate help—of difficult obstetric operations which would tax the skill of experienced obstetricians in well-equipped hospitals. Although the Committee recommended in their Interim Report a more practical and prolonged period of obstetric training for the medical student, it is not expected that it will ever be possible, even were it desirable, to give every student the craftsmanship which is necessary to make him an expert obstetrician any more than to make him a competent operating surgeon. The Committee are convinced that there can be no question of the importance of the part he has to play, but in the interests of the mother there are limitations to his sphere. It is desirable that teachers of obstetrics should realise the importance of directing the attention of the student to early differentiation between normal and complicated cases in order that he may refer to institutions all those which are unsuitable for domiciliary treatment. He should be trained thoroughly in ante-natal care, the management of the commoner abnormalities and emergencies, the performance of the simpler obstetric operations and manipulations, and the methods of applying the principles of antisepsis in domiciliary practice. After qualification he will realise that with the great extension of medical knowledge which has taken place of recent years it is impossible for him to become an expert in every branch of medicine, and that he can only cover a selected portion of the vast field in which his life's work lies.

The Committee are fully aware that there are many men and women in general practice who have a special aptitude for midwifery. They should be encouraged to perfect themselves by the added experience obtainable in appointments in suitable maternity hospitals or clinics. Such practitioners, if acceptable to their colleagues, may well be appointed as consultants in country areas where specialists limiting their practice to obstetrics and gynaecology are not available.

Institutional Treatment.

As was stated in the Interim Report, excellent results have been obtained in the patient's home, even in unfavourable surroundings, but by no means all cases are suitable for domiciliary attendance. Cases requiring hospital treatment on medical grounds fall into several categories.

(1) *During pregnancy.*—These include practically all cases of toxæmia of pregnancy, for it is rarely possible in a working-class home to secure the rest, the rigid adherence to restrictions in diet, or the other treatment needed. The disastrous results of an attempt to treat such patients at home are evident in many of the cases investigated by the Committee and fully justify the practitioner in urging upon the patient a course which she is naturally often unwilling to adopt at an early stage. Cases of pyelitis, and a number of patients suffering from general disease, especially heart disease, require careful indoor treatment. Cases in which there is bleeding during the later months of pregnancy, the serious prognosis of which if left at home is referred to in Chapter II of the Report, should be admitted as soon as practicable.

(2) *Arrangements for admission for confinement* should be made during pregnancy where ante-natal examination has revealed abnormalities likely to require Cæsarean section, induction of labour or difficult forceps delivery. The admission of primigravidæ for confinement, even when no complications are expected is a precautionary measure favoured by some experienced obstetricians, and this is specially desirable for the sake of the child in cases where a breech presentation is diagnosed.

(3) *During labour.*—All difficult forceps cases, many cases of ante-partum hæmorrhage, and any in which labour is likely to be unduly prolonged or difficult, should be admitted to a hospital. On the other hand, it is important to note that patients suffering from profound shock or collapse after severe hæmorrhage may incur greater risk from removal than from treatment on the spot even although the facilities available may be imperfect. The general practitioner should be prepared to deal with such cases without delay. Later the services of a consultant may prove of great value, and skilled nursing by a competent and well-trained midwife may readily be the determining factor in saving the patient's life.

(4) *Cases of puerperal sepsis and puerperal pyrexia.*—The Committee are greatly impressed with the importance of early examination, bacteriological investigation and admission to hospital in cases of puerperal pyrexia. The general practitioner is often in a difficult position in this matter. The pyrexia may be for the first day or two of slight or moderate degree, and there is a reasonable probability of the condition being a trivial one, so that he is tempted at this stage to adopt a watching attitude. There is no doubt, however, that if the pyrexia marks the early stage of a septic infection the delay in investigation and appropriate treatment may destroy the patient's chance of recovery, a train of events noted in a number of deaths reported to the Committee. A striking illustration of the importance of this early admission to hospital is afforded by the experience at the isolation block of Queen Charlotte's Hospital. Of twenty-six cases delivered in their homes on the hospital district who became infected by hæmolytic streptococci (sporadic infections) and were admitted to the isolation block after immediate bacteriological examination the mortality was 7·7 per cent. These cases were usually

admitted on the second or third day of fever. Of ninety-two other cases from other sources similarly infected, most of whom were admitted considerably later in the course of the fever, the mortality was 42 per cent. Facilities for bacteriological investigation are now placed at the disposal of practitioners in practically all areas by the Public Health Departments, and arrangements for further research in special cases have been made by the Ministry of Health and the Medical Research Council as described in Chapter VII.

(5) *Cases of abortion*.—The need for increased institutional accommodation for these cases has been referred to in Chapter II.

Apart from these medical indications the question of *domestic conditions* must be considered. Though there appears little, if any, increased incidence of puerperal sepsis in insanitary dwellings, the deplorable conditions of overcrowding sometimes found and the inconvenience arising from lack of space and equipment render confinement in these surroundings entirely unsuitable—*e.g.*, where a patient during the puerperium has to share her bed with her husband or with several children or even with a handywoman. The need for hospital provision applies also to women in lodgings or living with their parents, or those living in inaccessible country or mountainous districts far from doctor or midwife.

Many health authorities have increased the number of beds set aside for maternity patients in their hospitals, but it seems that they are to some extent being used for normal cases where such conditions do not obtain. The Committee consider it essential that women coming under the categories set forth above should have the first call upon such beds.

Extension of maternity accommodation in the country is clearly necessary, and the Committee wish briefly to refer to two points which appear to them of importance. First, they desire to emphasise the need for giving special consideration to facilities for medical education when proposals for extension of maternity hospital accommodation are under consideration, whether by municipal authorities or by voluntary bodies, and for this reason they are of opinion that in centres containing medical schools provision of such extra beds should be largely made in the hospitals associated with these schools.

Secondly, they believe that new maternity units should, where practicable, be provided in association with general hospitals rather than as isolated units. In expressing this opinion they are in no way minimising the admirable work which has been done by many of these special hospitals, but they believe that in addition to the saving which may be expected in capital cost and in working expenses, a higher standard of obstetric practice can be attained where the resources of a general hospital and the services of specialist staff, non-obstetric as well as obstetric, can be called upon at any moment.

The Committee desire further to draw attention to the value of close relationship between hospital and domiciliary practice, as shown by the good results obtained by many institutions undertaking

both. These are mostly teaching schools for students or midwives, and no doubt the control exercised over the clinical work by the teachers plays an important part, but it should also be realised that there is likely to be less objection on the part of the mother and her relatives to admission to hospital when they know she will remain under the care of the same staff. It would be of advantage if institutions thus making themselves responsible for the midwifery in their immediate area were encouraged to increase their activities by means of subsidies from Local Authorities.

In order to overcome as far as possible any unwillingness on the part of doctor or midwife to send cases to hospital, the Committee consider it of importance that in such cases the fee of the midwife should be secured to her (*vide* Midwives Report, paragraph 74), that the doctor should have access to the patient during her stay in hospital, and that a report on the treatment adopted and the result should be sent to him on her discharge.

We should like again to mention in this connection paragraph 187 of our Interim Report, where it was pointed out that in many areas midwifery services might be greatly extended and improved by co-operation between cottage hospitals and nursing associations.

Maternity Hospitals.

The Committee desire to place on record certain general principles which they believe should be observed in the provision of Maternity Hospitals.

(a) They are strongly of opinion that cases of puerperal sepsis, whether arising in hospital or admitted from outside, should not be treated on the premises of a maternity hospital unless an entirely separate block, with separate nursing and ward staff and separate staff accommodation, is provided.

(b) They consider that for emergency or other cases which may be a source of danger to other patients on account of potential, though not declared, sepsis special provision should be made. Labour wards should be small, permitting of only one delivery at a time, and they should be washed down after each delivery. One or more such labour wards should be reserved exclusively for emergency cases or other cases in which there is reason to fear the development of sepsis, and subsequent to delivery such cases should be nursed in small two- or three-bed wards, not in the common wards with strictly normal cases. Separate nursing staff should be allocated for delivery and for nursing during the puerperium.

(c) Abortions should not be admitted to the maternity wards of a lying-in or general hospital, but should be received in a gynaecological or septic ward according to the nature of the case.

The *size of the maternity unit* is a matter of some importance, as its efficiency largely depends on the perfect co-ordination of the different sections—ante-natal, natal and post-natal—and largely also on the constant individual supervision by doctors and nurses of long experience. In very large units this essential co-ordination

and personal supervision is apt to break down, and mistakes may more readily occur which pave the way to difficult labour and death. The Committee, therefore, advocate, as likely to give the optimum of safety, hospitals providing from fifty to sixty maternity and five to ten ante-natal beds with an associated district of not more than 800 to 1,000 cases per annum. Similar advantages may, of course, be secured in larger institutions if they are organised in separate units with their own medical and nursing superintendents.

Medical Staffing of Maternity Hospitals.

Another matter to which the Committee's investigations have led them to attach great weight is the method of medical staffing and control of maternity hospitals. It appears from the Committee's enquiries into maternal deaths that it is not uncommon for urgent and serious cases admitted in labour to a hospital to come primarily under the care of a house surgeon of limited obstetric experience, who is often expected not to send for a member of the visiting staff until his own attempts to deal with the case have failed. The Committee unhesitatingly condemn this practice. They consider that experience in the management of such cases and in actual manipulation, which it is of the greatest importance for junior practitioners to obtain, should be acquired under the *direct supervision of an experienced chief*. The practice in the hospitals of Denmark, Sweden and the Netherlands, where the training of young specialists is admirably carried out on these lines, appears to the Committee in this respect greatly superior to our own.

The method of medical staffing must necessarily vary with the greatly differing type of institution. A system is adopted at the Rotunda Hospital, Dublin, whereby a "Master" and one or more Assistant Masters (all with special obstetric experience) are appointed for a term of years and are resident in hospital and responsible for the clinical work. The Obstetric Units at University College Hospital and the Royal Free Hospital are similarly staffed by full-time, although non-resident, specialists. This system may, perhaps, be regarded as ideal in respect alike of the care of patients, the teaching of medical students and pupil-midwives and the training of junior practitioners who hold resident posts in the hospital, but it is obviously applicable only to a large hospital.

Another good system is that adopted in some of the teaching hospitals in both London and the provinces, where a Resident Medical Officer or Resident Obstetric Registrar who has already gained experience on the resident staff of a maternity hospital is appointed for a term of about three years. The junior house surgeons work under his direction, and he refers cases of exceptional difficulty to the honorary visiting staff.

Some of the large maternity departments in municipal general hospitals also need the services of a resident obstetric specialist if the best results are to be obtained. These hospitals may be the sole provision in a wide area for the reception of cases of serious abnormality and emergency, and it is of great importance that a general

practitioner, who may himself have extensive obstetric experience, should, in sending patients to such a hospital, have confidence that a high degree of skill and care will be available. In one at least of these hospitals the appointment has recently been made of a resident specialist, with time allowed for private practice. Where the maternity department of a municipal hospital is not large enough for a full-time specialist officer it is desirable, unless one of the staff has exceptional obstetric experience, that a consultant should be appointed and summoned for all difficult cases by the resident medical officer in charge.

Another problem is that of the voluntary or municipal general hospital which includes one or more maternity wards with beds varying from five or six up to twenty or thirty in number. In the large towns, where alone it is possible for a doctor to give his full time to specialist practice in this branch, there is usually a specialist honorary medical staff and a house surgeon, often without previous experience since qualification, who holds office for six months. In the smaller towns the hospital is as a rule staffed by experienced general practitioners, again usually with the help of a house surgeon. It appears to the Committee that it would be of great advantage to the progress of obstetrics and the care of maternity patients if it were more usual in hospitals of this type to appoint at least one member of the visiting staff as obstetrician and gynaecologist to the hospital, instead of admitting cases of difficult labour or severe ante-partum hæmorrhage under the care of a general surgeon. In all these hospitals large enough to employ a resident medical officer, whether staffed by specialists or by general practitioners, the safe and satisfactory working of the maternity wards must depend largely on the rules laid down for the house surgeon and the degree of direct responsibility assumed by the medical staff.

There remain to be considered the small maternity homes and the maternity wards in cottage hospitals. These are, as a rule, necessarily staffed by general practitioners, and the provision now being made by Local Authorities in many areas for payment of consultants who may be called by such practitioners in difficult cases should prove of great value. The obstacles in the way of maintaining a high standard of hospital administration where the clinical work is in the hands of a large number of practitioners of varying degrees of knowledge, experience and capacity have been referred to by the Committee in the Interim Report (para. 96), where reference is made to the importance of a single medical officer being placed in administrative control.

Anæsthesia and Analgesia.

The Committee devoted a chapter of their Interim Report to consideration of the use of anæsthetics and analgesics in obstetric practice, and published in the Appendix reports furnished by the Royal College of Physicians, the British College of Obstetricians and Gynaecologists and the British Medical Association. On this matter

they have no observations to add in their present Report. Convinced as they are that the best interests of the mother will be served by an increasing employment of well-trained midwives in normal labour, they would regret such a general demand for anæsthesia in these cases as would interfere with the attainment of this end. Experiments on methods of securing anæsthesia and analgesia are being made at maternity hospitals in both London and the provinces, and it is hoped that further research will bring to light a method of relieving pain suitable for use by midwives and free from the disadvantages now in some cases inseparable from the use of general anæsthesia.

CHAPTER IV.

STATISTICAL POINTS.

The statistical aspect of maternal mortality was reserved by the Committee for consideration in their Final Report.

Various criticisms have been put forward as to the methods of recording maternal deaths, and particularly the inclusion among maternal deaths of certain conditions, such as abortion and ectopic gestation, which are not represented in the registered births on which the maternal mortality rate is calculated. Further criticisms related to a point noted by the Committee themselves in their Interim Report, namely, the fact that foreign statistical methods as to certification of maternal deaths and calculation of maternal death rate are not uniform with each other or with British methods, and are in some instances far from complete, so that no accurate comparison can at present be drawn.

On these matters the Committee have sought the assistance of the Registrar-General, who has kindly furnished them with a memorandum on the method of compilation of maternal death statistics in England and Wales and a note on comparison of such statistics with those of foreign countries.

It will be seen from this memorandum that the basis adopted in England and Wales, viz., the number of maternal deaths per 1,000 live births, is not uniformly adopted by all countries and that there are also considerable discrepancies arising from the different principles adopted in the classification of maternal deaths. It may be noted that the maternal death rates as they are generally understood and quoted are based on the deaths "classed to" pregnancy and parturition by the Registrar-General, that is, the "total puerperal mortality," not those "in or associated with" those conditions.

Registrar-General's Memorandum (dated November 11th, 1930).

MATERNAL MORTALITY RATES—ENGLAND AND WALES.

In any account of the basis and method of compilation of the English maternal mortality rates two elements need to be dealt with. A mortality rate is an expression comprising both the deaths, or numerator, and the "exposed to risk," or denominator of the fraction. The two are strictly related and should correspond.

I.—The Deaths Included.

"Maternal mortality" is, of course, a general description of a group of specific causes of death represented by certain heads of

classification. The general classification in use is that of the "long" International List substantially amplified to serve our own national purposes. The heads comprised within the general description "maternal mortality" are Nos. 143-150 in the Registrar-General's "Manual." The list has recently been revised by an international conference, and the corresponding heads set forth in Appendix VI (ii) will come into operation in 1931.

At this point, however, a distinction must be drawn, which results, in fact, in the existence of two sets of figures of deaths included. In any exhaustive analysis by causes of total mortality each death must be assigned to one cause or heading and to one only. Thus in the case of deaths certified as due to more than one cause it is necessary to decide which of the joint causes is to determine the head under which that death is to figure in the complete tabulation. A death which is certified to be due to joint causes one of which alone is "maternal" may or may not be assigned in the complete analysis to the "maternal" cause.

For the solution of this difficult problem of joint causes rules of priority in allocation have for many years been in operation with international sanction. In 1900 a general international procedure was laid down, but its interpretation and application in practice was left to the several countries to determine. The rules hitherto in force in this country are set forth in the Registrar-General's "Manual" (p. xxi). But it should be added that the policy of the Department has for some time been adverse to any extension or crystallization of such arbitrary rules of selection. Deliberate efforts have been made to improve the machinery of certification so as to assist and guide the certifying medical practitioner to express definitely his own considered conclusions as to which of any joint or contributory causes was in fact the cause of death. This object has not as yet been completely attained, but a point has been reached at which the Department is disposed to limit the application of the arbitrary rules to those cases only where it is clear *prima facie* that the practitioner did not understand what he was expected to do.

The deaths classified under the specific "maternal" causes in the general tables of mortality by causes accordingly *exclude* some deaths for which, according to the medical certificate, a "maternal" cause was in part responsible but which, owing to the operation of the rules of selection, have been assigned to some other non-maternal joint cause. But for the purpose of the special study of maternal mortality the Department makes a practice of collecting *all* deaths in regard to which there is on the practitioner's certificate any mention of conditions indicating "maternal" causation. There are thus two statements of "maternal" deaths in the Registrar-General's statistics. One is described as referring to the deaths of women *classed to* pregnancy and child-birth, while the other is described as referring to the deaths of women *in or associated with* pregnancy and child-birth. The contents of the latter, of course, include those of the former.

Every reference in the medical certificate to pregnancy or child-bearing is dealt with in the manner stated above for the reason that it is the duty of the certifier to include no condition which was not causally related to the death. It is, however, impossible to ensure that this duty is always strictly performed. Prior to 1911 the certifier was asked to state whether a deceased woman had died within a month of parturition irrespective of the existence of any causal connection between the two events. There is ground for the surmise that this instruction, though long since superseded, is followed by some of the older practitioners.

But both statements of maternal deaths *exclude* certain analogous deaths which may or may not be deemed a proper subject for inclusion according to a strict consideration of the purposes to be served. Deaths due to deliberately procured or criminal abortions come under review by a coroner, and in view of the legal aspects of the case are certified as suicide, manslaughter, etc. The number of such cases in 1929 would represent a rate of 0·10 per 1,000 live births.

II.—The “*Exposed to Risk*.”

Rates calculated in regard to both statements of the deaths are based upon live births. From the point of view of the previous observation that the numerator and denominator of the fraction should correspond the following points may be noted:—

(a) In the calculation of the rates both the deaths and the births are those registered in the calendar year. As deaths are necessarily registered more promptly than births, the figures of births and deaths registered may not bear precisely the same relation to one another as the deaths and births which took place in the same period.

(b) Multiple births are included not as one but according to the number of live-born infants registered.

(c) The deaths included comprise those which occur not only in connection with live births but also in connection with still-births, abortions, miscarriages or prior to any form of parturition at all. The registration of still-births has only recently been adopted in this country; and as reliable figures of still-births are now becoming available the Department has been considering the modification of the “exposed to risk” element to include still-births as well as live births. But with regard to the other types of “exposure to risk” no records are available or are likely to be available by means of which the denominator could be brought into fuller correspondence with the numerator in this respect.

The following figures suggest, however, that the inclusion of still-births, while obviously reducing the absolute level of the English maternal mortality rates, may not materially disturb their relative movements. Figures on both bases will be published in the 1929 Text Volume of the Registrar-General’s Statistical Review, and will continue to be published on the dual bases for a sufficient period to enable statistical continuity to be assured.

	1928.		1929.	
	Per 1,000 live births.	Per 1,000 total births.	Per 1,000 live births.	Per 1,000 total births.
Puerperal sepsis ...	1.79	1.72	1.80	1.73
Other puerperal causes	2.63	2.52	2.53	2.43
TOTAL	4.42	4.25	4.33	4.16
Non puerperal causes ...	1.20	1.15	1.49	1.43
TOTAL MATERNAL DEATHS	5.62 1,000	5.40 961	5.82 1,000	5.59 960

III.—Elements affecting Comparability with other National Statistics.

Lack of comparability may, of course, arise in connection with any of the above particulars.

In regard to the deaths included it is understood that in a number of countries the figures employed of both deaths and births relate to those *occurring* during the period, not, as in England, to those *registered*.

Further, comparability with the statistics of any other country will depend upon the adoption of a corresponding classification of maternal deaths. The classification should certainly be comparable in the case of those countries which have adopted either the Long International List or the Intermediate International List, in both of which the same specific causes are separately classed, though with less sub-division in the latter. In the case of other countries the matter would depend upon the actual classification adopted and the actual content of the deaths included.

Comparability with the English statistics of deaths *classed to* pregnancy and childbirth would, however, depend also upon the nature of the rules applied by the particular country in the case of joint causes. There are differences between the practice of different countries in this respect, and an Appendix is annexed on the subject. As to the future prospects it may be said that there are two schools of thought. Some countries (particularly the United States), recognising the bearings of these rules upon the comparability of all mortality statistics, have been pressing for an attempt to secure the general adoption by international agreement of detailed uniform rules of selection. This country in particular and some others (*e.g.*, Italy) hold the view that concentration upon detailed and arbitrary rules is the wrong objective, and that the proper method of approach to the problem is to endeavour to dispense with the necessity for such rules by facilitating an expression of opinion by the certifying medical practitioner as to which of joint causes was the true cause of death.

Other sources of discrepancy as to the deaths included may arise out of differences in the several national systems of medical certification or death registration. Uniformity in these matters, conditioned as they are so largely by the social and political conditions of each country, is hardly attainable.

As regards the "exposed to risk" basis, it is understood that total population at all ages is adopted in some cases and female population at all ages in others. As between countries which aim at some basis representing the number of parturitions the possible elements of discrepancy have been referred to above.

Where live births alone are included, comparability may be affected by the discrepancies which exist in the various definitions of still-birth and thus in the complementary definitions of live-birth. These discrepancies were examined a few years ago by a Committee of the League of Nations, which recommended the international adoption of a uniform formula. This country and the United States were unable on legal and administrative grounds to adopt the formula recommended; but on subsequent consideration of the matter it was demonstrated to and acknowledged by the League's Commission of Statistical Experts that the practice in England, though differing from that recommended, did in practice produce results which were identical within a negligible margin. Some countries have expressed a willingness to adopt the formula recommended, while others are unwilling or unable to do so. Perhaps the greatest discrepancy in practice arises out of the procedure prevalent in certain countries adopting the Code Napoleon of deeming the birth to be a still-birth if the "death" of the child is registered within a certain period. But it will be obvious that so far as concerns maternal mortality rates the main discrepancies in definition will be extinguished by the aggregation of both live-births and still-births to serve as a measure of exposure to risk.

As regards the inclusion of abortions and miscarriages, the Department is not aware that figures are regularly available in any country save in the very special case of one or two municipalities in Germany.*

* The following papers are included in the Appendix:—

- (i) A note by the Registrar-General as to the Rules of Tabulation in "joint" causes of death.
 - (ii) Nomenclature of "Revised International List."
 - (iii) Detailed International List as elaborated in Registrar-General's Department and now in use.
 - (iv) Nomenclature and basis of calculation used by various countries.
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CHAPTER V.

THE MATERNITY SERVICES OF THE NETHERLANDS,
DENMARK AND SWEDEN.

The low rates of maternal death officially quoted for certain European countries—especially the Netherlands, Denmark and Sweden—have been the subject of special consideration by the Committee. Two questions naturally arise—firstly, whether such rates are comparable with those of England and Wales, both as to definition of maternal deaths and methods of calculation, and secondly, if this is the case, what factors in the social conditions and maternity services of the different countries may be considered to have a bearing on the result.

With a view to the investigation of these questions, two members of the Committee, Dr. Oxley and Professor Miles Phillips, together with Dr. James Young, of Edinburgh, a co-opted member of the Clinical Sub-Committee, undertook to pay a visit to the Netherlands, Denmark and Sweden.

The difficulties in comparing maternal death statistics in different countries have been fully set forth in the Memorandum by the Registrar-General, quoted in Chapter IV. of this Report, and were well known to the investigators. Their first step was to find out, if possible, what discrepancies there might be in the practice of the three countries as compared with England and Wales in regard to the recording of maternal deaths and the computation of the maternal death rate. In this respect they were able, thanks to the courtesy of officials and of the medical profession, to obtain valuable information, which may be briefly summarised.

In the *Netherlands* the average maternal death rate for the five years 1925-29 is 2·98, as against 4·21 for England and Wales. The investigators were able to satisfy themselves that the methods of certification and their verification by the central department, and the custom as to allocation of deaths to the category “maternal,” follow the same lines in the two countries, so that the maternal death rates can approximately be compared.

In *Denmark and Sweden* the official maternal death rates for the five years 1925-29 average 2·74 and 3·12 respectively, as compared with 4·21 for England and Wales. Enquiry showed, however, that certain causes of death, which in the English returns are classed to childbirth, were habitually excluded from this category in Denmark, and also that in both these countries the method of classification where more than one cause of death appears on the certificate diminishes the number of cases which would in England have been ascribed to maternal deaths. The investigators arrived at the opinion that in consequence of these discrepancies the official figures as they stand do not give a true idea of the relative maternal mortality, and that if the rates in these countries were computed upon the English basis they would approach more closely to that of

England and Wales. In all the countries there has been a definite rise in the recorded maternal mortality rates in recent years. Different reasons for this were given in each country, but it would seem that in all the greater care now exercised in death certification has been an important factor in bringing about this result.

The survey brings out several features of importance from an obstetric aspect which are here summarised.

In the opinion of the investigators there is a wide difference between the social conditions and habits of life in these countries and in many parts of England and Wales. A legacy from the rapid industrialisation of the early nineteenth century in England is the building over large tracts of country of ill-arranged and cheaply constructed houses, which all too quickly degenerated into slums, where overcrowding is rife, the atmosphere smoke-laden and the opportunities for healthy outdoor exercise almost *nil*. Broadly speaking, it is in these very areas or else in scattered country districts, as in Wales or Cumberland, where ante-natal supervision, medical attendance and hospital treatment are hard to secure, that maternal mortality has become consistently high. No such districts exist in the countries visited. In the Netherlands, where the density of population is nearly equal to that of England and Wales, the population is distributed over the country in small towns rather than collected in congested districts, and in Sweden, although there are large tracts of inaccessible mountainous and forest country, these are so sparsely populated and the births are so few that they are almost negligible from the point of view of maternal mortality. Town planning and reconstruction are being energetically carried out. In Amsterdam, what is practically a new town with parks and wide boulevards has been built within the last few years, in which is housed a large proportion of the people from the older and more crowded parts of the town. The same holds true for Copenhagen and other towns, both large and small, while Stockholm has been almost entirely rebuilt within the present century. Diet, the importance of which as a factor in the prevention of septic infection has been recently emphasised by competent authorities, appears to be better balanced than in England and Wales, and includes a larger consumption of milk, especially during puberty and adolescence. Probably in consequence of these hygienic conditions there is a more natural pelvic development, less rickets and a smaller incidence of contracted pelvis, circumstances which cannot but have a large influence upon the safety of childbearing and childbirth, and it would appear that in the fight against maternal mortality these countries have an easier task than we have in England and Wales.

Although, with the exception of the Netherlands, there is no definite evidence that the maternal mortality is substantially less than in England and Wales, it would appear that in some important respects the routine service for midwifery in these countries is superior to our own. This arises chiefly from the fact that midwife and general practitioner, hospital and obstetric specialist have each their allotted part. In England, during the eighteenth century, the midwife was

in some degree displaced by the doctor, but this was never the case in these three foreign countries. On the other hand, it was about that time the different States began to concern themselves with the *training of midwives*, so that by process of evolution there has been brought into existence in all of them a body of trained women of relatively high professional status, and it has for long been the custom for them to be employed in normal childbirth by all classes of the community without a doctor. Their training takes place in State-provided or State-aided schools, few in number, well equipped, and staffed by teachers of professional rank. It is a legal requirement that the authorities in each health area shall appoint the number of midwives necessary for efficient attendance, and only the number likely to be required is admitted for training.

The *general practitioner* appears to receive a somewhat more practical training than in England, though his attendance upon normal cases of midwifery after qualification may be limited. His function is to be called to abnormal cases by the midwife, and his habit then is to send all but the simplest abnormalities to hospital. He is not expected, as is his English prototype, to perform difficult obstetric operations in unsuitable surroundings without the necessary equipment and professional help. The patient is admitted to the *hospital*, usually State-provided or under the municipality, without difficulty, and when there she comes under the direct care either of an *obstetric specialist* or, in the case of the small towns, under a resident medical officer who has had special experience through having held a resident post in one of the large maternity hospitals.

The account by Dr. Oxley, Professor Phillips and Dr. James Young of their enquiries in the Netherlands, Denmark and Sweden is set out below. They are greatly indebted for the courtesy and help extended to them by professors, medical officers of health, general practitioners and midwives. They desire specially to acknowledge the valuable co-operation of the following gentlemen:—

In the Netherlands:—

Dr. H. W. Methorst, Director of the Central Bureau of Statistics for the Netherlands, The Hague;

Professor Van Rooy, Wilhelmina Gasthuis, Amsterdam;

Professor K. de Snoo, University of Utrecht;

Dr. Deyll and Dr. Neurdenburg, Public Health Department of Amsterdam;

Dr. Blaisse, The Training School for Midwives, Amsterdam.

In Denmark:—

Professor S. A. Gammeltoft, Rigshospital, Copenhagen;

Professor E. Hauch, Rigshospital, Copenhagen;

Dr. Frandsen, Director, Ministry of Health, Copenhagen;

Dr. Metz, Medical Officer of Health for the County of Holbaek.

In Sweden:—

Professor Ellis Essen-Möller and Dr. Ragnar Olinder, Lund;
Professor Birger Lundquist and Dr. Göthlin (Medical Officer
of Health), Gothenburg.

Table of Vital Statistics.

	England and Wales.	Nether- lands.	Denmark.	Sweden.
Officially recorded mater- nal death rate per 1,000 } 1920	4.33	2.4	2.8	2.6
live births ... } 1930	4.40	3.3	3.8	3.0
Year 1930.				
Population ...	39,806,000	7,952,634	3,542,000	6,130,826
Population per sq. mile ...	685	627	237	35
Percentage living in towns ...	79.3	75.5	43.0	31.0
Live births ...	648,811	182,310	66,303	94,200
Birth rate ...	16.26	22.92	18.71	15.36
General death rate ...	11.4	9.0	10.8	11.70
Infant mortality per 1,000 births	60	51	79	53
Percentage of total deaths due to tuberculosis ...	7.8	8.2	6.5	10.6

Number of Training Schools for midwives:—

England and Wales ...	194	Denmark ...	1
Netherlands ...	3	Sweden ...	2

Report on an Inquiry into the Maternity Services of the Netherlands, Denmark and Sweden.*

I.—The Netherlands.

In the year 1929 the population of the Netherlands was 7,832,911, the live births numbered 177,216, giving a birth rate of 22 per 1,000, whilst the total maternal deaths were 593, a rate of 3.3 per 1,000 live births. The general death rate for 1929 was 10.6 per 1,000 living population.

The chief occupations of Holland are agriculture, cattle breeding, horticulture, shipping and commerce. For a considerable time there has been a tendency for an influx towards the towns, and this tendency has been associated with an increasing industrialisation. About 75 per cent. of the population is urban. Three towns—Amsterdam, Rotterdam and The Hague—in 1926 possessed a popula-

* By W. H. F. Oxley, M.R.C.S., L.R.C.P., F.C.O.G., Visiting Obstetrician, East End Maternity Hospital; Miles H. Phillips, M.B., B.S., F.R.C.S., F.C.O.G., Professor of Midwifery, University of Sheffield; and James Young, D.S.O., M.D., F.R.C.S., F.C.O.G., Physician, Edinburgh Royal Maternity and Simpson Memorial Hospital.

tion varying from approximately 400,000-700,000; Utrecht had about 150,000; whilst there were ten towns between 50,000 and 100,000. The average density of population is very high—627 per square mile compared with a figure of 404 at the beginning of the twentieth century.

THE MIDWIFE.

The number of midwives maintained in the Netherlands is regulated by the State in accordance with the needs of the community. In 1929 there was a total of 919, or 1 per 8,523 of the population.

Training.

This occupies three years. There are three training schools for midwives, one at Amsterdam, one at Rotterdam and the third at Haarlem. The last is under Roman Catholic auspices. Before admission to the school the applicants must pass a government entrance examination. They are selected in order of merit, and in this selection attention is paid to the general appearance and carriage of the aspirant. There are between 30 and 40 in residence at any one time in each school. The social and educational standard of the applicants is on the whole good, and the fact that many more apply than can be accommodated means that the average of those obtained is kept at a high level. The training schools at Amsterdam and Rotterdam are under Government control, and in them the training is free. In the Catholic school at Haarlem fees are paid.

There are several important respects in which the training schools for midwives in the Netherlands differ from those in Britain. We have already alluded to the fact that (1) the Dutch schools are under direct governmental control. (2) In the second place the training is concentrated in a small number of schools specially set aside and specially staffed for this sole purpose. The midwives' schools are distinct from those concerned with the training of medical students. This denotes a great difference between the Dutch and British systems, for in the latter the training is carried out in a large number of schools of greatly differing size and efficiency, in many of which the training of medical students and midwives together implies a continual mutual competition for clinical cases, the number of which is usually restricted and insufficient for the double purpose. (3) In the third place in the Netherlands we do not witness the phenomenon so common in Great Britain, where a nurse with general training takes her diploma in midwifery, although she may have no intention of ultimately practising as a midwife. In Holland few generally trained women aspire to become midwives, and those only enter the midwifery training schools who purpose to devote their lives to the work.

The training, both theoretical and practical, is well planned, and the fact that three years are allotted implies that in Holland the standard of knowledge and skill of the midwife is of an exceptionally high order, and this enables her in after life to occupy a position of

outstanding importance in the midwifery service of the country. In the first year the instruction is largely theoretical, comprising physics, chemistry, anatomy, physiology, bacteriology and obstetrics. The practical and clinical work commences in the second year, and, after passing an examination, the pupil is allowed in the third year to attend cases outside the hospital under the supervision of a midwife. We were impressed by the importance which is attributed in Holland to the training of the midwife in ante-natal supervision. She is instructed in the taking and in the significance to be attached to the blood-pressure. The same features, as we shall see, apply to the teaching of the medical students.

We visited the training school at Amsterdam, which is staffed by a specialist in obstetrics and gynaecology, assisted by a general practitioner, who are both non-resident and in independent practice in the town. In their absence the Mistress Midwife is in charge. We were informed that at the school in Rotterdam the Director is resident. Dr. Blaisse, the Assistant to Dr. Meurer, the Director of the Training School at Amsterdam, informed us that during their three years' course the pupils see a total of about 1,800 cases. The training hospital admits about 900 to 1,000 cases per year. The majority of the cases are ante-natally controlled by the hospital from about the thirty-second week. The normal cases are admitted in labour, whilst ante-natal abnormalities requiring special treatment are admitted to hospital.

With regard to the instruction in technique, it should be mentioned that midwives are not allowed to use obstetric instruments or to employ opium or its derivatives. They are permitted to give ergotin by injection after the birth of the placenta, and we were informed that there is at the moment a movement on foot to empower them to employ pituitary extract in the second stage of labour in suitable cases. Gloves are not employed in normal midwifery. They are reserved for the protection of the hands in infected cases. A matter on which very great stress is laid is the method of cleansing of the hands. This consists in washing with soap and water for ten minutes, followed by rinsing in alcohol and then in a solution of perchloride of mercury (1 in 1,000). In regard to this question of surgical cleanliness we found that in Holland the midwife occupies a somewhat unique position in that her duties include the ante-natal care and conduct of labour, while in the puerperium her functions are supervisory only. She does not regard herself as in any way requiring to act as a nurse, and her special position is confirmed for her by the existence of a specially trained body of "baker" and "kraamverzorgster," which consists of women who have received a shorter training to fit them for the duties that in this country we associate generally with the "maternity nurse." The tradition which has thus earmarked the midwife for her own special purpose is an old one in Holland, and it has naturally contributed to the creation of the high position which she occupies. In addition to subserving the economic purpose of freeing her for her expert duties it is claimed that the fact that she does not carry out the usual

attendance in the puerperium, involving changing of the pads, etc., protects her against the risks of contamination.

Baker and Kraamverzorgster.

These are women who have not obtained a full training as midwives but who have been given a partial training to enable them to carry out the routine nursing of the mother in childbed and the general care of the baby. They are certificated by the State. They fall into at least two groups. There are, in the first place, those who have received six months' training at a midwives' school, with, as in Amsterdam, 18 months' additional service on the outdoor district under supervision. In the second place, there are those fully trained general nurses who serve for a period in the obstetrical department of the training schools for medical students. At Professor Von Rooy's clinic in Amsterdam, for example, the nurse who elects to take this training serves for 18 months in the obstetric department after completing her three years' training in the general wards of the same hospital. The *baker* and *kraamverzorgster* are not allowed to practise midwifery. They act as nurses to doctors and midwives. It is obvious that there is within the above groups a certain disparity in status, and this is revealed in practice by the fact that the latter and better trained group tend to serve as nurses for midwives and doctors practising among the well-to-do, when their charges are about six guilders (10s.) per diem, whilst the former group are frequently employed by municipalities to assist the municipal midwives in their practice amongst the poor, or they practise independently with doctors and midwives, when their fees are about three guilders (5s.) per diem. Experience has proved the value of the *baker* and *kraamverzorgster*, and this is reflected in the official recognition they receive. It is hoped by their increasing use to displace the inexperienced handywoman who still persists in places. We were informed that there is a proposal to institute a standard training of one year for the *baker*. Further, we were informed that the Public Health Service in Amsterdam hopes to arrange that the new *baker* will reside in the home of the parturient woman. The 18 *kraamverzorgster* for the poor at present in the employ of this municipality attend the homes three times daily.

Employment of Midwives.

Midwives in the Netherlands are restricted to the management of normal midwifery, and are compelled to call a doctor on the discovery of any abnormality before, during or after labour. They are not permitted to send a case to hospital on their own initiative. At one time they were responsible for the bulk of the practice of the country, but there is an increasing tendency for the better class practice to pass into the hands of the doctor, so that within recent years there has been a fall in the proportion attended by midwives from 75 to 60 per cent. of the total births. This development is viewed with disquiet in some quarters, and various methods have been suggested by way of a remedy. Thus, midwives have been

urged to charge no more than 15 guilders (£1 5s.) a case, whilst doctors have been advised to charge a minimum of 25 guilders (£2 1s. 4d.).

The proportion of births attended by midwives varies in different regions. As a rule the poor are served by midwives, and by statute each commune must for this purpose have a midwife. In populous areas, as in Amsterdam, where there are 17 municipal midwives, the service is whole-time, whilst in sparsely populated districts the midwife receives a subsidy from the commune for the purpose of amplifying her income from private practice up to a figure of 1,800 guilders (£150) per year.

THE MEDICAL PRACTITIONER.

In 1928 there were 3,827 doctors in the Netherlands or 1 to 2,020 of the population.

Training.

The training of the medical student extends over seven years. There are medical schools at the universities of Leyden, Utrecht and Groningen and at the municipal hospital at Amsterdam. The training in obstetrics, both theoretical and practical, is more thorough than it is with us. It commences in the fourth year and is continued throughout the three subsequent years. The student thus for four years has his mind occupied to a greater or less extent with the subject. During three months he is resident in the hospital and he has an opportunity of acquiring a sound perspective of normal and abnormal midwifery. He must attend personally on 20 cases (five in hospital during the fifth year and thereafter 15 cases at home), and it is specified that at least two of these must be abnormal. In the Amsterdam Medical School the practical experience of the students is supervised, each having a card on which the cases are entered, initialled by an assistant and signed by Professor Van Rooy. The students obtain a very thorough grounding in ante-natal care and in the personal examination of pregnant women. In addition to their obstetric training they spend six weeks in the gynaecological wards, during which time they are non-resident.

In the instruction of the student emphasis is laid on the danger of attempting anything but the simplest abnormal midwifery in the homes of the women, and the results of this training are well seen in the fact that throughout the Netherlands it is the practice of the doctor to send immediately to hospital those cases, with the exception of easy forceps, which require instrumental delivery, and it is more common than in our own country for cases of ante-partum haemorrhage, heart disease, toxæmia, etc., to be admitted at an early stage.

As we have already noted, the proportion of the total confinements in the Netherlands conducted by doctors is increasing; this arises from the fact that the younger generation of medical men are keener on this branch of practice than their predecessors. Communal midwives requiring a medical man for an abnormality in the case of the poor obtain the local practitioner, who receives a salary

from the Commune in return for this service; whilst in the case of women above this class they call on the doctor belonging to the *fonds* or voluntary insurance societies, to which practically all the wage-earning population of Holland belongs. These societies vary greatly in their nature. Some are mutual benefit funds managed by the insured, some are run and managed by employers, some are run on a commercial basis for profit, whilst others are run and managed by the doctors themselves.

The Specialist.

Holland is richly supplied with doctors specially trained in obstetrics. We gathered from hints we received in various quarters that there was at the moment throughout the country actually a superabundance of young men who had equipped themselves to practise as specialists in midwifery and gynaecology. To qualify for this position the aspirant requires to spend three to four years subsequent to graduation in the obstetric and gynaecological department of one of the University hospitals.

GENERAL OBSERVATIONS ON THE MATERNITY SERVICE OF THE NETHERLANDS.

The impression we gained from our investigation is that the maternity service in the Netherlands is exceptionally efficient. This arises in the first place from the fact that the practitioners—midwives and doctors—are unusually well trained for their duties, and, in the second place, from the fact that the Central and Local Authorities have taken an active share in the organisation and correlation of the services required for those economically unable to make provision for themselves.

Hospitals.

Throughout, the country is well supplied with hospitals and specialists. The municipalities are required by law to make hospital provision for the poor; otherwise there is no State enactment to cover hospital services, which, in the case of the working classes, are contracted for through the medium of the sick insurance. Religious bodies concern themselves largely with the provision of hospitals, and municipalities often contract with such bodies for the purpose of meeting their statutory obligations in regard to the poor.

We were informed that the ambulance service for transport of cases to hospital is well organised and adequate. A further feature to be noted is the provision of a municipal motor car service for the use of specialists in the towns called to the rural areas for attendance on emergency cases. In Amsterdam, for example, there is such a motor car service both attached to the clinic of the medical school and to the municipal health department.

The maternity hospitals of the Netherlands tend to restrict their clientèle to the very poor, the illegitimate cases and abnormal midwifery. In regard to the destitute we were informed at Amsterdam that there is an organisation concerned with making arrangements

for the care of the children of women whilst they are in hospital. This takes the form either of the provision of home helps or of removal of the children to a suitable institution.

We have already pointed out that one of the most prominent features of Dutch midwifery practice is the tendency which the doctor exhibits to send to hospital even his comparatively simple abnormalities. This constitutes one of the most signal distinctions between Dutch and British midwifery. Cases for forceps delivery, unless the head is low, are commonly sent to hospital. The same applies to cases of ante-partum haemorrhage and all but the mildest cases of toxæmia. The results of this early hospitalisation of such cases of difficulty and doubt are well exemplified by a comparison of the records of the large central institutions of the Netherlands with those of the corresponding institutions in Great Britain. It is well known that the records of large British hospitals which provide for the abnormal midwifery of an extensive area are sullied by the cases which have been allowed by delay to develop into grave emergencies before their admission. This applies especially to such cases as "failed forceps," placenta prævia, accidental haemorrhage and toxæmia. The records of such area hospitals constitute in a sense an index of the standard of the midwifery in the country as a whole. We were strongly impressed by the comparatively low mortality rates in similar hospitals in Holland. Thus, the obstetric department of the Wilhelmina Gasthuis in Amsterdam, in which a major proportion of the admissions consists of the abnormal midwifery of the city and the environs, and which has about 2,000 deliveries yearly, had only 76 deaths from all causes in 15,000 successive cases; that is, about 5 per 1,000.

In answer to our enquiries the directors of such hospitals at Amsterdam and Utrecht informed us that they practically never see cases of "failed forceps," and that when they do occur they are generally in the practice of the older and less efficient practitioners.

It was interesting to find that women are in the Netherlands seeking admission to the hospital or the nursing home in an increasing degree for their confinements. This tendency has been greatly accentuated of recent years.

Ante-Natal Care.

We have already alluded to the emphasis placed on this subject in the training of the midwife and doctor. Our investigations conveyed the impression that this teaching is being applied in a thoroughly practical fashion in those districts of Holland which we visited, and we were informed that, through the medium of the Press, lectures, the wireless, and active personal propaganda by midwives and doctors, the public is responding in a gratifyingly increasing degree to the efforts being made in these directions. Professor Van Rooy (Amsterdam), who is a strong advocate of education through the Press and the radio, told us that he is now commonly finding his cases reporting ante-natally as early as the fourth month of pregnancy. At the hospital of the Midwives' Training School in Amsterdam we were told that practically all the

900 to 1,000 women annually confined are ante-natally controlled from the thirty-second week onwards. It is true that to gain admission to the hospital "booking" at this stage is necessary. It is especially instructive to find that at this hospital there has been no mortality from eclampsia for several years. There were two deaths during the period 1929-30—one from pulmonary embolism, the other from placenta praevia. At the Vrouwenkliniek in Utrecht (Professor de Snoo) more than 50 per cent. of the women report at about the seventh month, and they make on an average four or five visits to the polyclinic. Professor de Snoo stated that out of 5,432 successive cases so treated ante-natally by his clinic, there had been no mortality from eclampsia. There had been ten deaths, a mortality of 1·8 per 1,000, and of these seven were to be classed as strictly "puerperal," or 1·3 per 1,000, and three as "incidental" (1 apoplexy, 1 pneumonia, 1 tuberculosis), or 0·5 per 1,000.

It has been pointed out that the community takes an active part in the provision of a maternity service for the poor, and that each commune must by statute support at least one midwife. On these midwives devolves the routine ante-natal care of the women, with appeal to the community doctor in case of abnormality. In the larger towns there may be several such midwives for the poor. In Amsterdam there are 17—one for each ward of the city. The midwife has as one of her duties to attend at specified days at the ante-natal clinic to examine the women on her list. Each district has one such clinic, which is housed along with the Child Welfare Centre. An official brochure states that the midwives "examine the expectant mothers mostly at the same time as the infant welfare conferences are held and in the same building. In this way they are in close contact with the infant welfare; they control the 'kraamverzorgsters' and create the link between the expectant mother and infant welfare." Further, the Centres "receive weekly from the Medical Statistical Department the names and addresses of the newly inscribed expectant mothers and mothers who are discharged at the polyclinic for obstetrics at the Wilhelmina Hospital."

Anaesthetics.

One of the features of Dutch midwifery which most impresses a visitor from Great Britain is the attitude towards anaesthesia in labour. We found that the routine practice is to deprecate entirely the employment of general anaesthesia in normal cases. We were told that even the higher classes, who are in a position to command it, rarely ask for it. We found a striking unanimity amongst the teachers and practitioners whom we interviewed in regard to these facts, and several expressed the opinion that recourse to anaesthesia for normal midwifery was bad in that it tended, on the one hand, to delay the natural process and, on the other, to increase the tendency to the adoption of artificial aids to delivery. In operative midwifery, of course, anaesthesia is employed as elsewhere. On occasions, where the suffering is very severe, a general anaesthetic may in a normal case be administered at the end of the second stage.

We have already referred to the fact that midwives are not permitted to use sedative drugs before the birth of the child. In regard to the employment of morphia and its derivatives by the doctor, we formed the opinion that the practice in Holland differs in no material degree from that obtaining in England and Wales.

OBSERVATIONS ON THE PHYSICAL CONDITION OF THE PEOPLE.

The visitor to the Netherlands cannot fail to be impressed by the generally healthy and well-nourished appearance of the people. The general death rate is low. During the period from 1925-29 it has ranged between 9·3 and 10·6 per 1,000 living population, as compared with figures varying from 11·6 to 13·4 for England and Wales during the same period.* Being a predominantly agricultural community the dietary of Holland is rich in those articles—milk, butter and cheese—which make for the sound development of the skeleton. From the obstetric point of view we must attribute to this nutritional factor the relative absence of those deficiency conditions, more especially rickets, which produce pelvic contraction and deformity.

Pelvic Contraction in the Netherlands.

One of the most important matters we set before ourselves in our visit to Holland was an attempt to assess the relative frequency of pelvic deformity and more particularly of the flat pelvis due to rickets, for it was clear that any appreciable difference between the women of Holland and England and Wales in these respects might account for some part of the difference between the relative obstetric death rates in the two countries. As the result of enquiries from practitioners who have experience of midwifery in different parts of the Netherlands, we found a surprising consensus of view regarding the relative infrequency of severe degrees of contracted pelvis. Thus, in Utrecht, Professor de Snoo found in 5,434 successive cases 118 women with pelvic contraction. Of these, 88 were delivered spontaneously, 17 were delivered by forceps, 6 were breech cases requiring assistance, in 4 version and extraction were carried out, *whilst in three only was Caesarean section necessary.* In no case was craniotomy performed. These figures reveal very clearly the rarity of severe pelvic contraction in Utrecht and the district. Professor van Rooy similarly assured us that severe degrees of pelvic contraction are rare in Amsterdam. In this respect there has to his knowledge been a great improvement within the past 30 years. When we note that Professor van Rooy's hospital is specially concerned with the abnormal midwifery amongst the poor of Amsterdam and its vicinity, we can recognise the significance of these facts. We received information of a like kind in regard to Rotterdam, Leyden and other districts, and we were thus led to the conviction that there is the strongest evidence for the belief that Dutch women, by virtue of their generally healthy skeletal development, are protected against the risks that are so commonly faced by

* Crude rates.

women in the industrial areas of England and Wales and Scotland. It is clear that this matter is of significance when we are attempting to establish a comparison between the efficiency of the maternity services of the two communities.

Pregnancy Toxaemia.

Although on this question we are unable to speak with confidence, we found some evidence to suggest that, in contradistinction to the relative immunity which Dutch women enjoy in respect to skeletal deformity, they suffer a certain obstetric handicap in being exposed to comparatively greater risks of toxaemia than exist in British women. Thus, Professor de Snoo informed us that at least 25 per cent. of his clientele exhibit late pregnancy toxaemia as revealed by hypertension with or without albuminuria. It is true that the recorded death rate from "albuminuria and convulsions" in the Netherlands is much less than that of England and Wales. The respective figures for 1929 were 0·34 and 0·81 per 1,000 live births. Without prejudice to the results that may follow on a fuller investigation into these matters, it is possible that the favourable Dutch experience flows from their stricter ante-natal supervision and earlier hospitalisation of such cases.

COMPARISON OF THE MATERNAL DEATH RATES OF THE NETHERLANDS AND ENGLAND AND WALES.

The maternal death rate per 1,000 living births in England and Wales in 1929 was 4·3, whilst in the Netherlands it was 3·3. During the five-year period, 1925-29, the average rates were respectively 4·2 and 2·98 (see Table I.).

TABLE I.

England and Wales.

Year.	Population.	Live births.	Maternal deaths.		General death rate. (Crude rates)
			Total.	Rate.	
1925 ...	38,890,000	710,582	2,900	4·08	12·2
1926 ...	39,067,000	694,563	2,860	4·12	11·6
1927 ...	39,290,000	654,172	2,690	4·11	12·3
1928 ...	39,482,000	660,267	2,920	4·42	11·7
1929 ...	39,607,000	643,673	2,787	4·33	13·4

TABLE I—*contd.*
The Netherlands.

Year.	Population.	Live births.	Maternal deaths.		General death rate.
			Total.	Rate.	
1925 ...	7,416,418	178,545	470	2·6	9·7
1926 ...	7,526,606	177,493	510	2·8	9·7
1927 ...	7,625,796	175,098	507	2·9	10·1
1928 ...	7,730,577	179,028	601	3·3	9·3
1929 ...	7,832,911	177,216	593	3·3	10·6

Before accepting these figures as an accurate comparative expression of the obstetric experience of the two countries, it is imperative to enquire into the methods adopted in the compilation of their statistics. During our visit we addressed ourselves to this question, and our conclusions tended to confirm in the main those of Sir Arthur Newsholme, who recently instituted an independent investigation into the comparability of the Dutch and English figures*. We ascertained that in the Netherlands each death certificate is scrutinised by the Medical Officer in the Central Bureau for Statistics at The Hague and in dubious cases (sepsis, peritonitis, embolism, haemorrhage, etc), this officer writes to the doctor concerned to discover any relation to pregnancy, parturition or miscarriage. We ascertained, moreover, that there is in existence a machinery by which the Maternity and Child Welfare Medical Officers of the Local Authorities can establish a still further check on the accuracy of the registration. In respect of this attention to the puerperal state in certification there is thus support for the view that the records of Holland and those of our own country can be compared.

The next question relevant to such a discussion on comparability is, however, not so easy to answer. This relates to the wide range of difference that is possible in different countries in regard to the definition of those conditions that should be designated as properly "puerperal," on the one hand, and those which though complicating pregnancy or the puerperal state are classed as "non-puerperal or incidental." Our investigations have shown that different countries vary in an unexpected degree in their attitude towards these questions. We have found, for example, very great variations in regard to the classification of deaths due to eclampsia and "albuminuria" (c.f. Denmark and Sweden). The absence of any definitions accepted in common by the different countries makes it impossible to ascertain how far in these and other respects the obstetrical experience of the countries can be compared on the basis of

* International Studies, vol. i., London. George Allen and Unwin, Ltd., 1931, p. 41.

their bare records. In regard to the Dutch and British figures the facts are not unequivocal, but the evidence, on the whole, has suggested to us that in general terms the data are parallel and provide a justifiable basis for such a comparison. They thus lead to the conclusion that the real maternal death rate in the Netherlands compares favourably with that of England and Wales.

The fact that the Netherlands, like England and Wales, employs the International List has enabled us to set out the maternal death rates of the two countries for the years 1925 to 1929 under the differential headings (see Table II). The rates are computed in terms of deaths per 100,000 live births.

TABLE II.

Comparison of Maternal Mortality in the Netherlands and England and Wales.

Differential Rates 1925-29, per 100,000 live births.

			1925.	1926.	1927.	1928.	1929.	Av.
Abortion (excluding sepsis) ...	Eng. & Wales	The Netherlands	13 14	12 24	13 36	12 26	10 11	12 22
Ectopic Gestation ...	Eng. & Wales	The Netherlands	12 10	14 5	15 8	13 14	13 6	13 8
Other accidents of pregnancy ...	Eng. & Wales	The Netherlands	20 5	21 6	22 10	16 11	21 12	20 9
Puerperal haemorrhage ...	Eng. & Wales	The Netherlands	52 54	49 52	50 49	50 61	49 59	50 55
Other accidents of childbirth ...	Eng. & Wales	The Netherlands	47 19	49 21	43 20	50 37	46 29	47 21
Puerperal sepsis ...	Eng. & Wales	The Netherlands	156 86	160 93	157 89	179 94	180 133	166 99
Puerperal phlegmasia alba dolens, puerperal embolism and sudden death ...	Eng. & Wales	The Netherlands	34 36	29 38	27 34	33 51	28 46	30 41
Puerperal albuminuria and convulsions ...	Eng. & Wales	The Netherlands	70 35	75 46	82 43	84 39	81 34	78 39
Childbirth not assignable to other headings ...	Eng. & Wales	The Netherlands	3 3	2 3	2 0	3 2	3 3	3 2
Puerperal diseases of the breast ...	Eng. & Wales	The Netherlands	1 1	1 0	1 1	1 0	1 2	1 1

It will be noted that the superiority of the Dutch figures springs in the main from the lower rates found in the accidents of pregnancy and childbirth, in puerperal sepsis and in puerperal albuminuria and convulsions.

CONCLUSIONS.

1. The maternal mortality rate of the Netherlands is considerably lower than that of England and Wales.

2. Among the chief factors that explain the relatively favourable obstetric experience of the Netherlands there are:—

- (a) the sound training of the doctor and the midwife.
- (b) the extensive and efficient ante-natal supervision.
- (c) the tendency throughout the country for all but the simplest abnormalities to be sent to hospital as soon as they are detected.
- (d) the rarity of severe degrees of pelvic deformity.

II.—Denmark.

Introduction.

In 1929 the population of Denmark was 3,518,000, the live births numbered 65,297, a rate of 18·6 per thousand, and the general death rate was 11·2 per thousand persons living.

The population is homogeneous, the general state of health is good, and the people are tall and well developed. More than half the population is rural, being engaged in agriculture and dairy farming. The people live on their farms, which are usually small enough to be worked by the members of one family, so there is no large class of poorly paid agricultural labourers as in England. Apart from Copenhagen, with its 700,000 inhabitants, there are no towns of over 80,000. There is no overcrowding either in town or village, and in the country the houses are closely scattered, so that one is hardly ever out of sight of five or six.

The children are well fed, and their diet contains a large proportion of milk, butter, cream and eggs. They appear healthy and well nourished and the absence of apparent rickets is very striking to one familiar with the condition of the children in some of our large manufacturing centres. The general impression one gets from travelling in Denmark is that of a smiling countryside occupied by a happy, healthy and contented people.

It seems probable that the good hygienic conditions diminish the risks of childbirth in Denmark. There is reason to believe that the female pelvis is more roomy than in England, and that the incidence of deformities likely to interfere with the normal course of labour is remarkably low. The likelihood that the better balanced diet and open air life increase the natural resistance of the mother to such germs as may gain an entrance is a matter upon which a precise decision cannot be made, but it is one which merits consideration. Due weight does not appear to have been given by most observers to what may be called the better "obstetric basis" in Denmark in estimating the value of the maternity services.

THE MIDWIFE.

It is the custom in Denmark for normal midwifery to be conducted by midwives in the patients' homes, general practitioners taking normal cases only if the midwife is not available. In the year 1929 only 90 births were reported by doctors as having taken place in the absence of a midwife. In cases of abnormality the midwife calls in a general practitioner, who sends all except the slightest to hospital. The majority of unmarried mothers and a number of persons in receipt of public assistance are attended in hospital.

The Training of the Midwife.

There has been a State service of midwives in Denmark from the year 1714, and their training has been carried out at the Royal Maternity, and later at the "Rigs-Hospital" in Copenhagen, Department B, since 1787. It is interesting to note that the original register of pupil midwives is still in use after 150 years.

The Rigs-Hospital, Department B, is the only school for midwives in Denmark, and the teaching has since 1910 been in the hands of Professor Hauch, an eminent obstetrician, and a man with great enthusiasm for his work. The midwifery service of the country owes a very great deal of its efficiency to his personality, and the centralisation of the teaching makes for uniformity in the practice of midwives, which eases the task of their supervision when they have left the training school.

The pupils are drawn from the small farmer class, with some daughters of professional men, clerks, etc., very much as is the case in England. There are a large number of applicants, but only the number necessary to keep up the supply are admitted for training. Since the course has been extended from one year to two years, the excess of applicants over vacancies is less; last year there were 78 applications for 24 vacancies. The final choice rests with the professor. After one month's training on trial, the pupil has to pass a simple examination in general knowledge, and may be rejected as unsuitable for training, but the professor does not think this examination of much value; many of the most unpromising pupils make the best midwives, and he rejects very few. The course of training lasts for two years, and terminates with an examination, after which the pupil takes a modified form of Hippocratic oath, and is qualified to practise.

It is emphasised that the most important part of the midwife's training is to give her such a thorough teaching in the use of antiseptics that she develops a conscience which will not allow her to become careless when she is no longer under observation. Perchloride of mercury, 1-1,000, is universally used as an antiseptic for the hands. Gloves are not used for the ordinary clean cases, but only as a means of self-protection in cases with purulent discharge. It is said that their use is expensive, that there are difficulties in the way of their sterilisation, and that if they are used midwives are apt to become careless over the washing of the hands, with consequent danger if the gloves are defective. The use of masks is con-

sidered of more importance than that of gloves, and we were told that the morbidity in the beds attached to the training school had diminished since the introduction of masks. They are used during labour, but not in the lying-in wards.

The necessity of thorough abdominal examination is insisted upon. Very few vaginal examinations are made, and the pupil is told that she must not examine vaginally unless she feels that the examination will be of definite value in helping the mother or child. Vaginal examination by the midwife is altogether forbidden in infected cases, and also where there is dystocia or contracted pelvis, on account of the possibility of Caesarean section being required later on.

The pupils are taught that the function of a midwife is to attend normal labour only, and they are not allowed to give opium, pituitary extract or other drugs, with the exception of ergot when the placenta has been delivered. If opium is required it is a case for the doctor, and it is thought that if this rule were relaxed there would be a demand for other drugs, and possibly anaesthetics, to be added to the list.

The necessity of routine examination of urine is emphasised, but pupils are not taught to take the blood pressure. Ante-natal care and examination form now an important part of the training, and it is considered that midwives should be quite able to pick out obstetric abnormalities, and even general conditions, likely to increase the risk of parturition. Examination of all cases by a doctor is not thought to be necessary.

During their two years' residence in the Rigs-Hospital an average number of 3,000 deliveries takes place in the wards devoted to the training of midwives, and many of the pupils personally deliver over 100 cases, besides watching and attending clinical demonstrations on other normal or abnormal cases. The holding of a midwife's qualification is not considered necessary or even advisable for general nurses—in fact, the midwives' profession is looked upon as entirely distinct from that of nursing, an arrangement which effects an obvious economy in opportunities for practical instruction.

The Practice of the Midwife.

In 1929 the number of midwives in Denmark was 1,063. Apart from Copenhagen, where a considerable number of midwives practise privately, 71 per cent. of the midwives hold appointments as "district midwife," and these are distributed throughout the country in such a way that a midwife is available for every expectant mother. On a vacancy arising, candidates are selected by the County Medical Officer of Health, who gives preference to those whose home is in the neighbourhood. Now that telephones and motor-cars are in general use, it is found that midwives can cover more ground than formerly, and the districts are being enlarged accordingly.

The midwife's income is made up of a retaining fee from the county, varying from 700 to 1,000 kroner (£37-£55) per annum, and in addition she charges fees to her patients on a tariff of about 1 per cent. of the husband's income, with a minimum of 17s. 6d. and a

maximum of £8. The county pays the fees for poor patients and makes itself responsible for the payment of the rest if necessary. An additional retaining fee is paid in sparsely populated areas. The council also provides a "midwife's house" where she is obliged to live, telephone, means of conveyance in the case of poor patients (either motor-car, motor cycle or bicycle, as thought necessary), dressings and instruments. The houses we inspected were very pleasing, standing in their own gardens, with bathroom and all modern conveniences. Some, which were said to be old, were yet far better than the accommodation usually thought sufficient for midwives in England. Reserves are provided free for sickness or holiday, and retirement on pension, varying from £35 to £75, is optional at 65 and compulsory at 70 years of age.

A simple form of day book has to be kept, but there is no methodical inspection of a midwife's work, the authorities appearing to depend upon her personal character and pride in her work in keeping her up to the mark, and in this respect their judgment seems to be well founded. The county medical officer pays them visits when he happens to pass, or if he has any reason to suspect that their work is unsatisfactory. On one afternoon in the year a conference, attendance at which is obligatory, is held between the midwives and the county and district medical officers. At this the day-books are inspected and a talk given by one of the Medical Officers on a clinical subject.

So far as we could judge from the small number of midwives we were able to interview, the work as a whole appears to be well carried out, and to do credit to the teachers, and they appeared to take great care of their personal cleanliness. Nevertheless, in two respects we felt a certain amount of disappointment. We refer to the ante-natal care and that during the puerperium. Not more than about one-half of their patients appear to be seen at all before labour, and of those which are seen few receive more than one inspection. It would seem as if the comparative rarity of contracted pelvis has prevented the necessity for ante-natal examination being fully realised, and, in fact, no great harm appears to have arisen from undiscovered cases of disproportion. We were told by a general practitioner of good standing that he had never known such a case to be missed by the midwife. Although the urine is sent up fairly regularly by messenger, the regular examination of the patient remains largely undone, and it seems that a campaign for the tightening up of ante-natal supervision is required in Denmark, as it is in England. The midwife's visits during the puerperium extend only until the fifth day, or until the "cord has dropped," and after that she depends upon friends or relatives to inform her if anything goes wrong. The women are now, however, often attended by the district nurses provided in many rural municipalities.

No arrangements have been made by the authorities to provide a "home help," a friend or neighbour usually acting in this capacity, but an attempt in this direction is now being made in Copenhagen by means of district nurses.

The number of midwives in Denmark works out at one for every 62 deliveries (the actual number is less than this, as some births take

place in hospital), but a very capable midwife in a country district told us that she had no difficulty in attending from 114 to 120 cases per annum.

Post-certificate courses lasting 14 days are held at the Rigs-Hospital in Copenhagen. They are free to the midwife, and as the numbers applying exceed the vacancies, a certain proportion only are allotted to each county, and the selection of midwives needing the courses is left to the County Medical Officer. Midwives over 50 years of age are seldom sent.

Midwives' Procedure in Abnormal Cases.

We formed the opinion after interviewing doctors and midwives that doctors are usually sent for in good time in abnormalities, even slight ones. Calls for obstructed labour are extremely uncommon. A doctor who receives about 20 to 50 calls per annum said that he had found forceps delivery necessary only once in the course of six years. Prolonged labour with weak contractions is the commonest abnormality for which he is called, but the call in many cases meant nothing more than that the mother wished for an anaesthetic. There has been, in fact, in the last few years an increasing demand for anaesthesia, and in calls for this purpose it is usual to combine the administration of an anaesthetic with the injection of pituitary extract in the second stage. As will be seen later, it is thought that this practice may be the cause of the slight rise in maternal mortality which has taken place in the last few years.

It proved impossible for us to ascertain the number of midwives' cases for which medical help is procured throughout the whole of Denmark, but the Medical Officer for the county of Holbaek, which comprises about one quarter of the island of Zeeland, was kind enough to supply us with the following figures for the year 1930:—

Number of midwives	37
Number of midwives' cases	2,298
Artificial aid at delivery	4.5%
Administration of pituitary extract ...	414 (1926—290)
Administration of anaesthetic	415 (1928—320)

It will be seen that nearly one case out of five is now receiving an anaesthetic and pituitary extract, and that the number has rapidly increased during the last few years. This increase in calls is alarming the friendly societies from whom the fee is payable, and they are trying to obtain a certificate from the midwife that the doctor's presence was really necessary.

We were struck with the high regard which is paid to the midwife, and no doubt she has earned this position through the good work she has been doing for the last 150 years. Her life is hard, but the amenities she enjoys make her profession an enviable one, and ensure a constant supply of suitable candidates for training.

We formed the opinion that domiciliary midwifery in Denmark is well carried out, and that the general standard of clinical work is good, but in some respects, especially in ante-natal care and in the care of the puerperium, there is room for improvement. Although

she enjoys a more enviable status and a longer training, we were unable to convince ourselves that the work of the Danish midwife was in any way superior to that of the better type of English midwife. More is expected of English midwives, although their emoluments and professional status are not nearly so high.

THE GENERAL PRACTITIONER.

Training.

The Danish medical curriculum is seven years in length. Medical students receive their midwifery training at the Rigs-hospital, Department A, under Professor Gammeltoft.

During the eighteen months before the final examination their time is at the disposal of the Professor for five hours a week, and he arranges the details of the course. There are very few set lectures. Two hours weekly are devoted to clinical lectures upon actual cases, either obstetrical or gynaecological, and two hours to "examinations." These are really discussions between professor and students, and are followed by a short written exercise. The fifth weekly hour is devoted to demonstrations on the mannequin, and to practical examination of the pregnant woman. Each student in turn spends twenty-four hours in the maternity department, and he is in addition encouraged to attend the ante-natal clinic during the vacations. The students have thus very little practical experience, and only twenty-four hours' residence, but the large proportion of bedside teaching is intended to limit this defect as far as possible.

The final examination does not qualify them to practise midwifery. Before being allowed to do so, the newly-qualified doctor must reside in the hospital for one month, during which period he is responsible for taking cases, and has to apply low forceps, perform version and other manipulations under the direct supervision of the professor or his first assistant. He also attends the polyclinic mentioned under "Hospitals." This course is not compulsory, but, as a matter of fact, all men take it, as they might be seriously handicapped later if they were debarred from doing the limited amount of midwifery which falls to the lot of most general practitioners in Denmark. Stress is laid during instruction upon the advisability of securing early admission to hospital of all but the slightest abnormalities. A large number of men take a six months' resident post, as, although eligible to help the midwife, without it they would be less likely to obtain one of the numerous posts as medical officer to a municipal hospital in town or country district.

Post-graduate courses for general practitioners are arranged at the Rigs-hospital, Department B (Midwives' block), and are largely attended.

Practice.

General practitioners do not compete with midwives in attending midwifery cases. They book none, even in the well-to-do classes, although of late years expectant mothers who have booked with a midwife have been arranging with doctors for an anaesthetic, but

this practice does not extend to a large percentage of the whole. In most cases where an anaesthetic is desired the midwife sends for the doctor without previous arrangement.

A large number of women belong to sick clubs, and are entitled to the doctor's care during pregnancy, but very few ask for it, nor does he offer it, as ante-natal supervision is looked upon by both as the function of the midwife who is to attend at the confinement. Although in the country midwives rarely seem to send the patient to the doctor on account of abnormalities during pregnancy, this is not the case in Copenhagen, where midwives often send patients for abnormalities in a previous labour or the present pregnancy, and some of these are sent by the doctor to the ante-natal department at the Rigs-hospital for consultation with a specialist.

The practice of doctors is to send abnormal cases to hospital early, even though the abnormality may not be severe. A slight case of ante-partum haemorrhage or of albuminuria would be watched at home for a few days; delivery of the head with low forceps would be performed, but for more serious conditions both mother and doctor consider hospital treatment indicated. By means of the excellent ambulance service admission can always be secured within one hour of originating the call, and the municipal hospital, even in country districts, admits all cases sent by doctors without question. When there, they come under the care of a specialist, or failing him of a doctor who has had at least six months' experience in an obstetric hospital. Although this is the general practice it fails occasionally, as will all human practices, and a perusal of the reports of the Rigs Hospital for the years 1927-29 reveals three cases, one of which was a "failed forceps," in which delay in admission appeared to be a factor causing the death of a patient. This is, of course, an extremely small number, and by no means vitiates the general principle that *bad cases are sent to hospital without unsuccessful attempts at delivery having been previously made.*

MATERNITY HOSPITALS.

Denmark is lavishly provided with hospitals, nearly all of them under the State or municipal authorities. There were in 1929 no less than 196 hospitals with a total of 19,339 beds, which is at the rate of 5.5 beds per thousand inhabitants.

The following is a list of the Maternity Hospitals or Departments in Denmark, 1929:—

		<i>Beds.</i>	<i>Deliveries.</i>	<i>Maternal Deaths.</i>
Copenhagen, the Rigs Hospital	... ..	114	2,972	17
Copenhagen, the Rigs Hospital (Section C)	... ..	28	787	2
Fredriksberg Communal Hospital	... ..	13	297	3
Fredriksberg Frantz Howitz' Private Hospital	... ..	16	266	1
Aarhus State Hospital	... ..	60	1,184	9
Total	... ..	231	5,506	32

There are also in Copenhagen seven private nursing homes with 28 beds. There were 323 deliveries in these in 1928.

In addition to the above, and serving the requirements of the smaller towns and country districts, there is a well-equipped publicly provided hospital within easy distance of every person, which admits abnormal obstetric cases at the request of general practitioners, and the Medical Officer to which has had special experience in obstetrics from post-graduate residence in a maternity hospital. We were told that Caesarean section is more common in these hospitals than at the Rigs Hospital, but we were unable to obtain the exact figures.

In Copenhagen is situated the large State hospital (the Rigs Hospital) which serves as the only training school for medical students and midwives.

The obstetric wards in this hospital are arranged in three sections:—

- A. Professor Gammeltoft, for medical students;
- B. Professor Hauch, for pupil midwives;
- C. An overflow situated apart from the main hospital.

Admissions to A. and B. are made on alternate days, and to Section C. are sent none but apparently normal cases.

The professors live in quarters provided in the hospital; they are allowed to take private work, but nearly all their time appears to be taken up with teaching and hospital duties.

The admissions to the hospital are as below: —

- (1) Unmarried mothers collected from the whole of Denmark comprise about two-thirds of all admissions;
- (2) Women in receipt of public assistance;
- (3) Women belonging to sick clubs, at the request of their doctor only;
- (4) Obstetric emergencies to the number of five or ten per month.

There is also an obstetric polyclinic. By this is meant a system whereby the first or second assistant, accompanied by two newly qualified doctors, go into the town to complicated cases, sent for by the midwife. This is an important part of the young doctors' education. They are allowed to perform the simpler operations (forceps, version of a second twin, suture of severe perineal ruptures) under the supervision of the assistants, and they have thus the opportunity to see the greater difficulty of working in the private house as compared with the hospital.

There is an ante-natal department at which in 1929 1,012 patients were seen, and 1,500 in 1930, but this does not represent the whole of the ante-natal supervision for the hospital patients as some attend an ante-natal clinic in the town, which we believe to be the only ante-natal clinic in Denmark apart from hospital departments. We were unable to ascertain the actual number attending here, but formed the impression that not more than one-half of the hospital patients were examined before admission for confinement. Toxaemia, either purely due to pregnancy or supervening on a pre-existing nephritis, is of frequent occurrence, and cases of eclampsia

averaged twenty-five per annum during the last three years. The majority of these had not had ante-natal care. The case mortality was low—three out of seventy-five. Stroganoff's method of eliminative treatment was used in most cases; there were six Caesarean sections.

Pelvic measurements below the normal are uncommon, and contracted pelvis rare, the rickety type being seldom seen. In the last 11,299 cases delivered only 99 (0·9 per cent.) required artificial aid for this condition, either induction (40 cases), forceps (24), version (10), Caesarean section (22) or craniotomy (3). When one bears in mind that two-thirds of the patients are primiparae and that a fair number of emergency cases are admitted, one is surprised at the extraordinarily small number of women who failed to deliver themselves spontaneously.

We were told that the incidence of sepsis in this hospital is low, and our informant expressed the opinion that this may be due to the fact that midwives deliver all normal cases; "doctors in general practice cannot keep their hands clean enough for midwifery; it is more important to keep the hands free from germs than to wear gloves."

Cases of raised temperature that occur are treated in the ordinary wards unless they have rigors or very definite local signs of infection, when they are removed to one of the single bedded rooms, with a special nurse, who, however, mixes with the other nurses for meals and during off-duty times. There is no "septic block" in the hospital, and emergency cases have to go into the ordinary wards, although the danger of this is recognised. Cases of puerperal fever arising outside the hospital are not admitted, but are sent to the municipal hospital for infectious diseases.

The wards are small, the largest containing six beds, the intention being to use them in rotation with an interval for cleaning each time they are vacant. There is, however, an increasing demand for hospital beds both on account of the smallness of the rooms in the modern houses and from a desire for anaesthetics, and this procedure cannot now be carried out. The overcrowding of the hospital is giving rise to anxiety lest an outbreak of sepsis should occur, but up to now it has been free. In Department A many of the patients get anaesthesia for normal delivery, but in Department B it is more difficult, as there are only three or four doctors on the staff.

Cases of abortion are admitted, but to the gynaecological wards only if under five months' gestation. Abortion is increasing slightly, but not to the extent that is said to be occurring in Germany.

The deaths which occurred in the hospital in the last three years, during which 11,299 women were delivered, were 61, of which 45 were due to childbirth. Sixteen of these were due to sepsis. General disease accounted for the other 16. In only one death had ineffectual attempts to deliver by forceps at home been made. The death rate from puerperal causes is 4 per thousand.

Obstetricians familiar with the class of case admitted to maternity hospitals in England will be struck by the small number of deaths in this hospital, serving a population of well over 700,000, and admitting practically all the bad cases that arise therein. There is no

doubt in our minds that the early sending of cases to hospital before ineffectual attempts at delivery have been made is very largely responsible for this low mortality.

COMPARISON OF THE MATERNAL DEATH RATES OF DENMARK AND ENGLAND AND WALES.

When one attempts to estimate the value of the maternity services of Denmark by a study of their maternal mortality one is faced with difficulties considerably greater than those presented by the Netherlands. Statistical records of causes of death have been kept in Denmark since the year 1860 with comparatively little change of method, and some useful deductions may be drawn from them as to the trend of mortality and its variations from time to time; but we found early in our visit that the differences in compiling the returns between Denmark and our country are so great as to make the figures as they stand not susceptible of comparison.

The Trend of Mortality.

From a chart which we were shown and from official figures published in the "Annuaire Medicale 1929 Danemark" we found that there was a well-marked drop in maternal mortality in the closing years of the nineteenth century, and this was due to the deaths from sepsis falling from 2·6 per thousand in 1890-94 to 1·5 per thousand in 1900-04. This was caused without doubt by the introduction of antiseptic methods in midwifery, and the halving of the rate in ten years shows how effective were the measures then employed and how quickly they permeated the mass of midwives who then as now were responsible for nearly all the midwifery in Denmark. Since then the death rate from sepsis has remained, with slight periodic variations, at about the same level, and in the last 20 years or so a slight but steady rise in the deaths from "other causes" has been taking place. The reason for this is uncertain, but it was pointed out to us that the rise synchronised with the introduction of the use of pituitary extract in labour, a practice which has been referred to already as becoming increasingly common. It seems likely, however, that this rise may be due, in part at least, to the fact that the practitioners, especially during the last few years, have been instructed by the Board of Health to put down the cause of death on the death certificate more carefully, and to record the fact if the death had any connection with childbirth.

The sepsis rate is slightly lower in the rural districts than in Copenhagen, and in this respect does not differ from that in England and Wales.

The Comparability of the Statistics.

The difficulty in obtaining figures which will be strictly comparable for England and Wales and for Denmark is twofold; the first arises from differences of nomenclature of the causes of death used in the two countries, and the second from the difference in practice in classifying deaths when both a puerperal and non-puerperal cause have contributed to it.

No official figures of maternal mortality as a whole are published for Denmark, and those which are usually quoted in this country are derived by adding together the deaths from “*Febris puerperalis*” and “*In aut brevi post partum mort. (Fb. puerp. excl.)*” as found in the “*Causes des Décès dans le Royaume de Danemark*”. These are the only two headings in which childbirth is mentioned, but by no means all the deaths from childbirth are entered under them. For instance, puerperal eclampsia is entered under No. 68 “*Konvulsioner*,” and requires to be sorted out from the deaths from other forms of fits entered under that heading. Toxaemia, especially if death occurs early in pregnancy, cannot be termed as “*during or shortly after labour*,” and the same applies to some cases of embolism, especially if the mother dies after attendance upon her has ceased, and such deaths are frequently entered under headings other than childbirth.

If both a puerperal and a non-puerperal cause have contributed to the death, as, for instance, ante-partum haemorrhage occurring in a patient with valvular disease of the heart, there appears to be a tendency for the certifying doctor to ascribe the death to the initial disease rather than to its immediate cause, whereas we understand that in England and Wales an acute disease almost always takes precedence of a chronic disorder, and such a death would be entered under puerperal haemorrhage. Such differences in the practice with regard to the certification of " joint causes " may make a considerable difference to the total maternal mortality.

On discovering these discrepancies we sought an interview with the Principal Medical Officer to the Danish Board of Health, who was kind enough to promise that with the help of Professor Gammeltoft he would prepare a list of deaths attributed to childbirth for the year 1930, which would be, as far as possible, comparable with the figures for England and Wales. He has now done so, and classified them in detail in accordance with the new Inter-Scandinavian nomenclature, which is to be used as from January 1st, 1931.

Denmark. Cause of Death, 1930.

No.						Deaths.
131	Placenta praevia ...	...	...	...	...	20
132	Aliae haemorrhagiae (abort. excl.) ...	...	...	...	...	16
133	Abortus (non-septicus) ...	...	...	...	...	3
134	Graviditas extrauterina ...	...	...	...	...	14
135	Ruptura uteri ...	...	...	...	...	4
136	Aliae dystochiae ...	...	...	...	...	13
137	Eclampsia gravid. et parturient. ...	...	...	...	...	22
138	Toxaemiae aliae ...	...	...	...	...	18
139	Septichaemia puerperal post-partum	}	...	...	...	78
140	„ „ post-abortum					
141	Embolia in puerp. (non-septica) ...	...	...	...	...	38
142	Alii morbi graviditatis et partus ...	...	...	...	...	28
Total ...						254*

* Since our visit the figure 254 as given above has been published as the maternal deaths for Denmark for 1930. A circular letter has also been sent to all medical men directing them always to mention in their death certificates pregnancy or childbirth whenever they have in any way contributed to the death, and to state the number of the new nomenclature to which death should be ascribed.

In addition there were five deaths from convulsions among women in the childbearing age, without further description.

As the number of live births in Denmark in the year 1930 was 66,303, the death rate for that year works out at 3·8 per thousand, the figures for England and Wales being 4·40, while for "Rural England,"* where the conditions more closely resemble those of Denmark, the rate of 3·95 is almost identical.

Although the use of this new Danish classification will enable a more correct comparison of the different causes of death directly due to childbirth, it does nothing to get rid of discrepancies in the method of dealing with deaths due to "joint causes." A closer conformity between the practices of the registrars and statisticians of all countries would seem to be advisable, but has proved in practice to entail difficulties which have up to the present been insurmountable. We believe that the matter is now receiving consideration by the League of Nations, and we hope that the committee responsible will see fit to avail itself of the special knowledge of obstetricians in this matter.

Summary as to Denmark.

1. The general health and development of the population is good, and the incidence of contracted pelvis is reported as very small compared with England and Wales. These conditions diminish the risk of childbirth, and their existence ought perhaps to make us hesitate to ascribe any difference in the maternal mortality of Denmark and England entirely to differences in the character of the maternity work.

2. On account of differences in the classification of cause of death and in the practice when two or more causes have contributed to the death, the published statistics of the maternal mortality of the two countries are not comparable. More exact comparison will be possible in future, owing to the coming into operation of a revised form of nomenclature of diseases in Denmark. The special figures given us for 1930, although for one year only, are not markedly different from those of England and Wales.

3. The longer, fuller and more centralised teaching of midwives by men of professorial rank, the aid given by the State to ensure the provision of a well trained midwife for every mother, and the early admission of abnormal cases into hospitals staffed by experts are important points of practice in which England and Wales at present lag behind Denmark.

4. Ante-natal supervision forms the weak spot in an otherwise admirable service, and, as suggested above, the reason that this defect does not lead to a higher mortality rate is probably the very low incidence of contracted pelvis among the women of the country.

* See Chapter VI.

III.—Sweden.

Sweden differs in some important respects from the two countries we have already considered. Stretching its length of over one thousand miles well into the Arctic circle, it is subject to great variations in climate and in duration of sunlight, and over an area half as large again as Great Britain and Ireland it has a population considerably smaller than Greater London, namely 6,112,000.

The birth rate, which in 1871-80 stood at 25·9 per thousand, has been steadily falling, so that in 1929 it was only 15. The live births in that year numbered 92,619.

The density of population varies greatly: the province of Skane in the south and the belts of country running along the east coast to Stockholm and the west coast to Gothenburg are fairly thickly inhabited and possess the only towns of large size in the country, namely, Stockholm, Gothenburg, Malmö, Norrköping and Hälsingborg, which between them have a population of one million persons. The interior and northern parts of the country are covered with thick forests and very sparsely populated, rendering aid to the sick difficult in the extreme. The Swedes, with their characteristic flair for turning the inventions of science to good use, have done much to diminish the difficulty of communication by means of telephones, and latterly have even instituted an ambulance service of aeroplanes.

Of the population, 68 per cent. is rural and engaged chiefly in agriculture and fishing, while only 38 per cent. are classified as industrial. Since 1925 there has been a steady influx to the towns at the expense of the rural areas, which are becoming depopulated at the average rate of 10,000 per annum. However, there is little poverty in the towns, no slums or overcrowded tenement houses and no smoke-laden atmosphere. The developing girls ride to their work on bicycles instead of in crowded 'buses and tubes, and after their day's work they resort to the parks, which even the smallest towns possess, where they can listen to the orchestra and take a meal at the open air restaurant. The population is largely of the Nordic type, their bronzed faces, flaxen hair, and generally healthful appearance being in marked contrast to the sallow complexions and stunted growth which are only too common in our large industrial centres. Temperamentally the women are placid and self-controlled, and appear mentally as well as physically fit for child-bearing. One could not help feeling that in this important respect the Swedish midwifery service has an easier problem to face than has the British Isles.

THE MIDWIFE.

The custom in Sweden for the last two hundred years has been for women of all classes to be attended in their confinements by midwives in their own homes, with the help of a doctor should abnormality arise, but an increasing number are now going into hospitals, especially in the large towns, with the result that now only about 78 per cent. are attended by midwives. Partly on this account and

partly because of the smaller number of births, the number of midwives on the register has declined, and in 1928 there were 2,754. As in Denmark, doctors do not attend normal midwifery.

Owing to the difficulty of communication in large tracts of the country, and the uncertainty or even impossibility of obtaining medical assistance, it has been found necessary to include in the duties of the midwife the treatment of many abnormal conditions which usually fall outside her sphere, the only restriction being that cutting instruments must not be used. In 1894, 612 forceps deliveries were performed by midwives, but with the rapidly increasing use of motor car and telephone and the building of hospitals in country districts the need for her to perform these operations has declined. Nevertheless, the number is still considerable, as will be seen from the following figures, which give the number of operations performed by doctor or midwife in the 75,168 confinements by midwives in the year 1927:—

<i>Operative treatment.</i>					<i>By midwife.</i>	<i>By doctor.</i>
Manual removal of placenta	...	...	...	...	104	712
Version	...	...	...	...	18	165
Forceps	...	...	...	...	36	1,393
Embryotomy	...	...	...	...	0	51

As the number of women stated to have died within three weeks of delivery was only 213, or 2·7 per thousand deliveries, we may safely infer that the midwife's skill is at least up to the average.

The treatment of uncomplicated cases of abortion is also undertaken by the midwives.

The Training of the Midwife.

It will be realised that the conditions we have described necessitate the midwife's training being exceptionally thorough, and we have, therefore, thought it well to go as fully as possible into the details of her instruction and clinical work.

There are only two schools for midwives in Sweden, situated in Stockholm and in Gothenburg. They are supported by Government subsidies and form integral parts of the large maternity hospitals belonging to those towns. The training in each is controlled by a whole-time professor, with the help of two or more assistant obstetricians and of the head midwife.

The course of instruction lasts for two years, with an examination at the end of the first year as well as at the end of the course. About twenty-five new pupils are entered yearly at each school, and there is an excess of applicants, who are chiefly country girls of the yeoman class. Candidates must have completed the primary school course and passed a simple test in general knowledge before admission. It is wished by teachers to have this standard raised, but the Diet fears that higher requirements might prevent that class of women from entering which is best fitted for the hard life among the peasantry which the profession entails, and has not acceded to their request. Candidates chosen are given a month on trial before final approval.

All candidates entering have the intention to practise as midwives. Very few trained nurses take the course, and they are excused the first six months of the midwifery training. At the end of the training the pupil is expected to be able to attend normal midwifery, including ante-natal care, and to perform the operations referred to above, but it is particularly stressed that a doctor must be called for all abnormalities, and that the midwife is to act only if one is not available.

Theoretical instruction and practical work are carried out concurrently during the two years' course, and the pupils are divided into two groups, first and second year, with some slight distinction in their uniform.

The first year's teaching is as follows:—

Theoretical:

- (1) First two months: Elementary bacteriology, infection, disinfection and vaccination.
- (2) Second two months: Anatomy and physiology.
- (3) During the next month: The general study of illness and the puerperium.
- (5) A six weeks' course: Nursing of the newborn child.

Practical:

During the first six months: Waiting upon the patients, sterilising instruments, learning to make abdominal examinations. They take no direct part in the nursing of the patients.

During the second six months: Instruction on bed making, vaginal examination, temperature taking and administration of enemata.

Second Year.

Theoretical:

- (1) First six months: Study of abnormal pregnancy, labour and puerperium. Writing labour reports: care and feeding of infants up to one year, special attention being drawn to the dangers of artificial feeding: diseases of infancy. A pediatrician gives the lectures concerning infants at a children's hospital.
- (2) Next four months: Obstetric operations, viz., low forceps delivery, extraction of breech, internal version, manual removal of placenta, suture of perineum. Repetition courses, especially in the use of antiseptics.
- (3) During one month: The prescribing of drugs employed by the midwife: the writing of reports, keeping of required registers, the statutes concerning midwifery and care of infants, etc.

Practical:

During the second year they take cases in the labour wards, making all necessary examinations, and attend to the infants. They are also responsible for the nursing of the lying-in women, and do ante-natal work under supervision.

During the whole of the training the practical work of the pupils is divided between labour and lying-in wards.

All deliveries take place under the supervision of either the head midwife or a trained sister, and from 100 to 125 cases are personally conducted by each pupil.

At the Gothenburg Maternity Hospital we watched a pupil deliver her 111th case, and as the method of delivery has the outstanding advantage that the soiling of the patient's clothing and sheets is avoided, and that the bowls and swabs can be placed in a convenient position, we think it well to describe the technique.

The patient was delivered on her back and an extremely well-designed bed was used, with footrests and pulling straps. Attached to the foot of the bed were uprights carrying a shelf on which bowls and instruments could be placed, while dirty swabs were thrown into a bowl slung from the under surface of the shelf. A sterile sheet was placed under the patient in such a way that the lower part could be lifted over the vulva between the pains. The hands and arms of the pupil had been prepared by thorough washing, spirit, and perchloride of mercury 1 in 1,000, and they were then protected by long sterile linen gauntlets with thumb only. These were removed as soon as it became necessary to control the delivery of the head. For the actual delivery a small firm mattress about fourteen inches square and four inches thick was placed beneath the sterile towel under the patient's buttocks. This brought the vulva into a most convenient position for observation and control of the oncoming head. Sterile cloths were now put over the abdomen and the slightly flexed thighs. The perineum was protected by pressure on the head only. The patient gave marked evidence of distress: she was reassured and encouraged, but no anaesthetic was given.

In this hospital masks are used in the labour wards, but no rubber gloves, except for cases with discharge or venereal infection. Internal examination is not made until it is expected that the cervix is well dilated and the head easily palpable, and preferably before rupture of the membranes. Vaginal examinations are not made by the midwife in cases of inertia, contracted pelvis, or in the presence of a discharge.

We satisfied ourselves that such training produces thoroughly competent and experienced midwives.

The Practice of Midwives.

There are very few differences between the practice and employment of midwives in Denmark and in Sweden. The same system of subsidies from the county with a tariff of fees, reserves for sickness, provision of houses, and compulsory retirement (although at the earlier age of 55) obtains. The system of keeping registers is very thoroughly carried out, and a summary of these is forwarded to the Board of Health every year and printed in the Annual Report. This appears a very useful practice, as one can see at a glance the amount of midwives' work, its character, the number of deaths which have occurred, and the number of times medical practitioners have been called in, for the whole of Sweden.

Two review courses of two weeks each, at stated intervals, are compulsory before the midwife has reached the age of 50. These take place at the public midwife schools, the Clinics of the Universities of Lund and Uppsala, and at the Maternity Hospitals at Norrköping and Malmö.

A new practice has recently arisen of allowing midwives, in country districts chiefly, to admit one, two or even three patients to their own houses for the confinement. This is under strict supervision. It is a measure to mitigate in some way what is increasingly recognised as the hardship of the midwives' calling, and the difficulties arising from the inaccessibility of the patient.

TRAINING AND EMPLOYMENT OF DOCTORS.

The medical curriculum in Sweden is of eight to nine years' duration, the first three years being devoted to preliminary studies, leaving at least five years for clinical work. There are medical schools attached to the Universities of Uppsala and Lund and to the Karolinska Institute in Stockholm. In each the midwifery training runs along similar lines. In addition to a thorough course of lectures, every student has, during his seventh or eighth year, to reside in the hospital for a period of *four months*, during which he is not allowed to occupy himself with any other branch of medicine, not even to the extent of attending lectures on other subjects. During the first two months of his residence he acts as "junior," and is allowed to examine patients and assist at deliveries, and during the next two months, as "senior," he is responsible for normal deliveries and for giving a certain amount of instruction to his junior. One of the resident clinical assistants is in frequent attendance in the labour ward, and must be called for any abnormality, and under his supervision the student is taught to apply forceps and to perform other manipulations. No midwives are taught or employed in the medical schools, trained nurses doing the actual nursing of the patients, and the number of cases is ample to provide each student with from *forty to fifty deliveries*. Attendance at the ante-natal department is compulsory, but there is no "district" work. The students also look after a few cases of abortion, in Stockholm in the maternity wards, and in Lund in the gynaecological wards.

As in the Netherlands and Denmark, we were impressed by the amount of time and care which is given by the professor to the personal teaching of the students and to his hospital patients. He lives in the near vicinity of the hospital, and appears to spend his whole day there, and has even a bedroom close to the ward, which he uses should a difficult case be likely to require his attention during the night. At Lund we arrived at the hospital at nine o'clock one morning, and found that the professor, who had been up in the night to deliver a hydrocephalic foetus, had just finished a vaginal Caesarean section for an emergency case of eclampsia, and was about to perform a laparotomy. This was not considered unusual, and had we not been there this heavy emergency work would not have interfered with the ordinary teaching routine. The residence by the student for four months in the atmosphere of the maternity hospital, living its life in company with the professor, seeing with him all new admission, observing his methods of dealing with both serious and slight abnormalities, and being responsible to him for the recording of all his cases, gives him a knowledge of

the principles of midwifery far in advance of that obtained by a medical student in this country. Nevertheless, the general practitioner does not consider it right to deal with every difficulty which may arise in private practice. It would appear that his training has inculcated in him a habit of mind which will not allow him to apply forceps prematurely, nor to attempt to treat in the unsuitable surroundings of the working-class home any but the simplest complications, when he knows that the facilities of a hospital staffed by competent obstetricians is available. We thus find that in Sweden cases of "failed forceps," the dangers of which are so clearly shown in Chapter II. of the Committee's Interim Report, are almost entirely absent, and we feel confirmed in the strong opinion expressed in the Interim Report that a more prolonged period of residence in a maternity hospital or department dealing with a large number of cases is essential for the proper training of the English student.

As in Denmark, the general practitioner undertakes few cases himself, and then only with the object of giving an anaesthetic in the normal cases whilst the midwife conducts the actual delivery. He has, however, an essential part in the midwifery of the country, coming to the aid of the midwife in every abnormality, treating simple complications and those which, owing to the danger of delay or removal, require to be dealt with immediately, and in arranging for the removal to hospital of the others.

Anaesthetics and Analgesics.

Swedish obstetricians discountenance the use of anaesthetics and analgesics on account of their liability to interfere with the course of natural labour.

Private patients are given an anaesthetic, when the head is on the perineum, if they ask for it, and are prepared to pay an extra fee for a doctor to administer it, whilst the midwife conducts the delivery. Midwives never give the anaesthetic. Either chloroform or ether is used for obstetrical operations.

Ante-Natal Care.

Ante-natal care is neither so thorough nor so extensively given as the obstetricians think advisable. The ante-natal departments of hospitals are frequently small and incompletely equipped, and we found that in Gothenburg not more than one-half of the patients had attended at all before admission for labour, and very few of these had paid more than one or two visits. Although the incidence of toxæmia appears to be somewhat higher than in this country, very few cases are sent into hospital at an early stage, either through general practitioners or from the four small ante-natal clinics in the town. Cases of eclampsia are admitted. During our visit, both to the Lund and the Gothenburg hospitals, a case was taken in: one from the town and the other from the country. Both were primi-gravidae who had not been examined ante-natally.

Post-natal Examination.

In Lund every woman who has been delivered is examined by the Professor or the Chief Assistant before she leaves the hospital. The examination includes inspection of the vulva and perineum, but not of the cervix.

HOSPITALS.

Although it is true to say that 78 per cent. of parturient women are attended in their own homes by midwives if the whole of Sweden is considered, this hardly gives a true picture of the state of affairs, for in the towns many new maternity hospitals are being built at public expense, and the demand for admission to them has in some places almost entirely displaced the midwife. Thus in Stockholm 87 per cent., Gothenburg 70 per cent., Malmö 87 per cent., and in Norrköping 71 per cent. of all deliveries took place in hospital in the year 1928. Moreover, the supply of beds is not equal to the demand, with the result that overcrowding takes place to a dangerous extent. The Barnbördshus at Gothenburg, planned for 96 beds, has frequently 125 and at times even 145 patients crowded together, and the South Barnebördshus at Stockholm, with a normal accommodation of 111 beds, had a daily number of patients up to 159 in 1928. This may well be an important factor in keeping up the high sepsis rate in Stockholm, and may account in part for the rise in the national death rate from sepsis which has occurred in the last few years. The lying-in period is 9 or 10 days in Stockholm—only 7 days in Gothenburg.

A considerable degree of difficulty is experienced in dealing with the increasing number of cases of abortion which are taking place in Stockholm, and some of them have perforce to be admitted to the maternity wards, but those which are known to be septic are taken to a special department with its own operating theatre intended primarily for the treatment of post-partum sepsis. To a smaller extent the same conditions prevail at Gothenburg, but at Lund the accommodation in the gynaecological department is sufficient for the smaller number of abortions they are called upon to treat. At the new maternity hospital which is about to be built at Gothenburg the plans provide for a separate wing for these cases.

The hospitals in Sweden are publicly provided, and positions on the staffs attract men of the highest standing.

Staffing of Maternity Hospitals.

In the larger towns the Maternity Clinic is always in charge of a specialist who, during his training, must have spent one or two years in a surgical clinic and at least two years in Obstetrical and Gynaecological Clinics.

In the small towns (5,000 to 15,000 inhabitants) the hospitals are provided with lying-in wards, which are in the charge of a chief surgeon, who has had special training in general surgery, but not always in obstetrics or gynaecology.

The Incidence of Contracted Pelvis.

In Sweden we found that the opinion of the professors as to the comparative infrequency of contraction of the pelvis corresponded to that for Denmark and Holland, and, as this is a matter of considerable practical importance, we thought it well to bring forward such statistical evidence bearing upon it as we could obtain. Accordingly, we obtained the figures set out below, (in each case representing a series of consecutive deliveries up to the end of 1929), from the clinical reports of hospitals in the countries we visited, which show the proportion of cases in which artificial aid at birth had been required on account of difficulty caused by contraction of the pelvis, and we have compared them in the following table with the records of two English hospitals. Class A, in the Guy's Hospital reports, includes only those patients ordinarily living in the Guy's Hospital Maternity District, whether delivered in their homes or in the hospital, and whether they have been attended ante-natally or not. Since this district is a compact area served by Guy's Hospital largely to the exclusion of other institutions or individuals, the proportion of abnormalities is neither reduced nor increased, and we believe that it may be taken as an average sample of the working class population of London. The criticism may, however, be made that artificial aid is perhaps employed at Guy's for slighter degrees of contraction than at the foreign hospitals, and we have, therefore, put down also the records of the East End Maternity Hospital. This Hospital deals with entirely unselected working-class mothers, and makes every possible effort to secure spontaneous delivery. Even in it, however, the "interference rate" is much higher than in the foreign hospitals, while at Guy's it is over four times as great.

					<i>Number of deliveries.</i>	<i>Number requiring aid at birth for contracted pelvis.</i>
<i>Sweden.</i>	Lund	...	...	...	2,079	17 (0.8 per cent.)
	Gothenburg	...	...	...	2,598	9 (0.4 " ")
<i>Denmark.</i>	Copenhagen	...	...	...	11,299	92 (0.8 " ")
<i>Holland.</i>	Utrecht	...	...	...	5,434	30 (0.6 " ")
<i>England.</i>	Guy's Hospital, Class A				4,703	170 (3.6 " ")
	East End Maternity Hospital	...	...	...	10,376	129 (1.2 " ")

It is, of course, not possible for us to obtain random samples of measurements of the female pelvis in different countries. Clearly we must use measurements made in hospitals, and it may be objected that hospital patients form a selection and that the principle of selection may vary from country to country. The following tabulation shows a difference between the two hospital experiences unlikely to be a mere chance deviation, and supports our own clinical observations and the opinions expressed by us. It is based on records which had been made in the ordinary course of work at the Gothenburg Maternity Hospital and at the Jessop Hospital in Sheffield, of the external measurements of the pelvis of the last 600 consecutive primigravidae who had attended the ante-natal departments at the

respective hospitals. It should be noted that in Sheffield rickets is prevalent and the maternal death-rate is high.

Interspinous.			Intercristal.			External Conjugate.		
Cm.	No. of cases.		Cm.	No. of cases.		Cm.	No. of cases.	
	Göthen- burg.	Sheffield.		Göthen- burg.	Sheffield.		Göthen- burg.	Sheffield.
18	—	2	22	—	2	—	—	—
19	—	7	23	6	7	15	1	—
20	2	28	24	3	19	16	1	4
21	21	69	25	25	62	17	6	43
22	59	90	26	66	122	18	55	125
23	106	107	27	156	185	19	132	230
24	142	101	28	165	113	20	181	148
25	136	109	29	87	60	21	136	32
26	70	56	30	83	25	22	64	13
27	51	20	31	7	5	23	21	2
28	10	7	32	2	—	24	3	3
29	2	4						
30	1	—						
	600	600		600	600		600	600

The figures give the following results:—

		Göthenburg.	Sheffield.
1. Average size of external pelvic measurements.			
Interspinous	... ..	24·3 cm.	23·4 cm.
Intercristal	... ..	27·7	26·9
External conjugate	... ..	20·1	19·0
2. Number with ext. conj. 17 cm. or less	... ..	8 (1·3%)	47 (7·8%)
3. Most common size of ext. conj.	... ..	20	19

The average size of the external measurements is one centimetre larger in Göthenburg, severe degrees of pelvic contraction are six times as common in Sheffield, and the usual size of the external conjugate diameter in non-contracted pelvises is one centimetre larger in Göthenburg.

Careful consideration of these data together with the general consensus of opinion of all the obstetricians we interviewed left little doubt in our minds that the *size and configuration of the female pelvis are more favourable to easy parturition in the countries we visited than in England and Wales.*

If that be so, we have a hopeful corollary to draw. There is no evidence that these differences are racial characteristics—according to anthropologists we are descended from the same stock—rather do they appear to depend upon the better conditions obtaining in these countries during the period of life when the pelvis is developing, and

it would seem that the provision of a better balanced and more adequate diet, increased fresh air and sunlight, and sufficient open air exercise during the whole of childhood, are means open to us as a nation which will help in bringing about a considerable reduction in maternal mortality.

MATERNAL MORTALITY IN SWEDEN.

When we consider the maternal mortality rate in Sweden we encounter difficulties similar to those with which we were confronted in dealing with that of Denmark.

The nomenclature of causes of death connected with childbearing differs from both the English and the Danish: that in use in Sweden being as follows:—

Morbi gravidarum et puerperarum.

7. *Abortus et partus difficilis.*
8. *Placenta praevia.*
9. *Eclampsia.*
10. *Septichaemia puerperalis.*
11. *Alii morbi e graviditate et partu.*

The form of death certificate has spaces in which to enter (*a*) the main disease and nomenclature number, and (*b*) contributory causes. When a certificate of death showing childbirth as the main cause comes to the Medical Officer of Health for the district he has to enter it for his annual report under one of the above headings, and he often finds difficulty in doing so, as the cause of death stated in the certificate frequently does not correspond with any of the headings and the nomenclature number is very seldom filled in. With regard to “joint causes” the doctor’s certificate as to which is the main disease is usually taken as correct. This differs from the English practice, where puerperal fever, puerperal haemorrhage and eclampsia take precedence of practically every other contributory disease.

The returns of maternal mortality of the Medical Officers of Health throughout the country to the Central Statistical Department are collected by them under two headings only, namely “puerperal fever” and “other diseases of pregnancy and parturition,” and it is these figures which appear in the official statistics for the country.

In order to obtain concrete examples of how actual deaths are allocated, we obtained the annual report of the Gothenburg Maternity Hospital for the year 1930, which contained short case histories of the maternal deaths which had occurred there. It so happened that in this year all the persons who died in the hospital were domiciled in Gothenburg. They numbered 15, as follows:—

1. Mitral stenosis and puerperal sepsis.
2. Puerperal sepsis and peritonitis and endocarditis.
3. Suppurative mastitis and pulmonary embolism.
4. Chronic nephritis and uraemia (four months pregnant) (incidental).
5. Septic endometritis and infarct of lung.

6. Toxaemia and flat pelvis; craniotomy; broncho-pneumonia, third day; died fifth day.
7. Eclampsia and sepsis.
8. Tuberculosis of lungs and peritoneum. (Incidental.)
9. Ante-partum haemorrhage, albuminuria, sepsis.
10. Septic abortion.
11. Thrombo-phlebitis of the iliac veins and vena cava.
12. Eclampsia.
13. Placenta praevia.
14. Albuminuria; pyelitis; septicaemia.
15. Myocarditis; ante-partum haemorrhage.

All these deaths, with the exception of Nos. 4 and 8 ("associated deaths"), would have been classified in England and Wales as due to pregnancy and childbearing, and would have been included in the annual maternal death returns for the town, whereas the numbers which were officially reported as maternal deaths in Gothenburg were only seven, as is to be seen in the following table, which was kindly constructed for us by Dr. Göthlin, Medical Officer of Health.

TABLE.
Deaths of Gothenburg Officially Classified as Due to Childbirth.

Year.	Live births.	Abortus et part. diff.	Deaths from—				Total.
			Placenta praevia.	Eclampsia.	Sepsis.	Alii morbi.	
1921 ...	4,402	—	—	—	4	3	7
1922 ...	4,281	2	—	1	4	1	8
1923 ...	4,128	1	—	1	4	2	8
1924 ...	3,536	2	1	1	3	1	8
1925 ...	3,684	1	—	1	—	1	3
1926 ...	3,538	1	1	1	2	2	7
1927 ...	3,096	1	—	2	—	—	3
1928 ...	3,158	4	—	1	3	—	8
1929 ...	3,185	4	—	—	2	3	9
1930 ...	3,142	—	1	1	5	—	7
TOTAL	36,450	16	3	9	27	13	68

This gives a death rate for 1930 of 2·2 per thousand, as opposed to 4·1 per thousand had the English method been adopted, even if no deaths had occurred elsewhere than in the maternity hospital, a point upon which we were unable to obtain information.

We did not feel justified in asking Dr. Göthlin to trace the classification of those hospital cases which he had not included in one or other of the headings under maternal mortality, as it would have

entailed a large amount of work, and we thought that the information and figures we had already obtained showed that the difference in the practice followed in Gothenburg on the one hand and in England and Wales on the other in preparing their statistics was so great as to render invalid any conclusion drawn from them as to their relative maternal mortality.

We next turned our attention to Stockholm, and from the official returns of that city constructed the following table, which shows that the average maternal death rate per thousand live births for the ten years 1921-30 was 5.1 (sepsis 3.8; other causes 1.3), and for the year 1930 it reached the figure of 8.6 (sepsis 7.2; other causes 1.4). Moreover, it shows a very definite rise in the last five years.

Maternal Deaths in Stockholm.

Year.	Abortus et part. diff.	Placenta praevia.	Eclampsia.	Sepsis.	Alii morbi.	Total.	Live births.	Deaths per thousand live births.
1921	5	1	1	18	—	25	6,260	3.9
1922	1	1	3	15	5	25	5,673	4.4
1923	1	1	1	20	—	23	5,495	4.4
1924	—	—	—	21	4	25	5,399	4.6
1925	5	3	—	14	2	24	5,376	4.5
1926	—	1	4	25	2	32	5,167	6.2
1927	1	1	4	16	2	23	5,043	4.6
1928	1	1	3	17	1	23	5,023	4.6
1929	—	3	2	23	3	31	4,823	6.4
1930	—	—	4	38	3	45	5,245	8.6
TOTAL	13	12	22	207	22	276	53,504	5.1

With the assistance of Professor Birger Lundquist we attempted to make a scrutiny of the maternal deaths occurring in Stockholm similar to that which we had made in Gothenburg, but owing partly to the difficulty in tracing the domicile of those women who had died in hospital, and partly to the fact that the statistics of the State Lying-in Hospital since 1928 had not been published, we did not meet with complete success. We again found some apparent discrepancies between the English and Swedish methods of compiling the returns as regards "joint causes," but we were not able to satisfy ourselves as to its extent.

The most striking feature which emerges from the Stockholm figures is the large proportion of deaths classed as maternal which are due to sepsis. The explanation given us from many sources was that this was due to sepsis following abortion, and, indeed, there appeared to be no doubt that abortion is very rife in Stockholm, and is increasing, although to a much slighter degree, both in Lund and Gothenburg. The difficulty in dealing with these cases has been so great as to lead to the opening in April, 1930, of a new

department at the Sabbatsberg Hospital exclusively for them. In its 28 beds there were treated up to the end of 1930 649 patients, of whom 13 died (2 per cent.).

Unfortunately, the official returns do not sub-divide deaths from sepsis, but a study of the case records of the South Maternity Hospital for 1926-30, and of the State Hospital for 1926-28 (the only years available), showed that of the 90 deaths from maternal sepsis occurring therein 62 (69 per cent.) followed abortion. We were thus enabled to compute with some degree of exactitude the part which "sepsis post-abortion" has played in raising the maternal death rate in Stockholm to its high figure, for if the 69 per cent. holds good for the few cases we were unable to account for, the deaths per thousand live births for the five years 1926-30 would be:—

Sepsis post-abortion	...	...	3·3
Sepsis post-partum	...	...	1·4
Other causes	...	...	1·4
<hr/>			
Total	...	...	6·1
<hr/>			

As we have stated above, these figures are not open to comparison with those of England and Wales. We understand that as from March, 1931, the following nomenclature of causes of death will be used in Sweden:—

- 5500 Placenta praevia.
- 5550 Ruptura uteri.
- 5560 Aliae dystochiae.
- 5600 Eclampsia gravidarum et parturientium.
- 5610 Septichaemia puerperalis—post-partum.
- 5620 Septichaemia puerperalis—post-abortion.
- 5630 Graviditas extrauterina.
- 5700 Alii morbi e graviditate et partu.

This will enable a differentiation of the various causes and the influence of abortion throughout the whole of the country to be made. However, no correct comparison between the maternal mortality of England and Wales and of Sweden will be possible until the machinery of certification with regard to "joint causes" has been brought into line.

CONCLUSIONS AS TO SWEDEN.

1. In some important respects—size of pelvis, state of general health—the Swedish women are, in general, better subjects for parturition than the women of the British Isles.

2. The training of both midwives and medical students is longer, fuller and better than that provided in the British Isles. This is specially seen in the highly organised schools and curriculum for midwives under the control of specially trained teachers of large experience.

3. The widespread provision of well-equipped maternity hospitals enables the teachers of both midwives and medical students

to stress the necessity for sending all but the most simple complications of pregnancy and labour into hospital, with the assurance that they will be attended by obstetricians of special experience. It should, however, be noted that the rapidly increasing demand by normal women for institutional confinement has recently led to overcrowding of many maternity hospitals.

4. Ante-natal care is not of the same high standard as the rest of the midwifery service.

5. The Swedish method of recording maternal deaths connected with childbirth differs from that used in the British Isles, and tends to yield a lower recorded maternal mortality rate than that which would obtain if the English method were employed.

CHAPTER VI.

HIGH MATERNAL MORTALITY IN CERTAIN DISTRICTS OF ENGLAND AND WALES.

The Committee have had under special consideration the varying maternal mortality rates in different areas in England and Wales, and particularly the persistent high rates in certain districts, a list of which is given below. The Medical Officers of Health of these counties and county boroughs have greatly assisted the Committee by furnishing information as to actual causes of death during the period under review, and by their observations on social and hygienic conditions, and on other factors which appear to them of importance. The following administrative counties and county boroughs in England and Wales had an average maternal mortality rate of over 5 per 1,000 births for the period 1923-29, and these areas have been used as the basis of the enquiry.

Administrative Counties.		Average maternal mortality rate (1923-29) over 5.00 (unweighted averages).	1923.	1924.	1925.	1926.	1927.	1928.	1929.
ENGLAND.									
Cumberland ...		5.33	5.60	5.78	5.27	6.23	5.38	5.29	3.78
Huntingdonshire ...		5.05	1.85	4.18	2.98	5.18	5.35	5.24	10.57
Lancashire ...		5.33	4.43	5.05	5.24	6.70	4.95	6.06	4.89
Isle of Wight ...		5.78	3.91	10.46	3.33	4.38	4.45	6.85	7.06
WALES.									
Anglesey ...		6.94	8.00	8.69	2.32	5.73	12.26	7.73	3.88
Brecknockshire ...		5.14	6.53	8.30	0.84	5.42	7.81	1.92	5.18
Carnarvonshire ...		5.23	4.93	5.28	5.46	5.30	6.51	3.91	5.25
Cardiganshire ...		6.67	6.64	10.26	7.22	4.74	4.01	8.26	5.63
Carmarthenshire ...		5.87	5.02	5.97	4.24	8.09	5.72	6.57	5.53
Denbighshire ...		6.58	7.79	5.27	6.15	8.00	5.32	7.94	5.6
Flintshire ...		5.51	3.39	6.82	7.30	1.45	5.66	7.12	6.85
Glamorgan ...		5.67	6.13	5.04	5.60	5.21	5.66	6.19	5.95
Merioneth ...		6.26	6.48	7.68	8.28	2.79	8.31	1.32	8.97
Radnorshire ...		7.07	9.50	4.96	7.43	5.09	5.18	5.90	11.46
COUNTY BOROUGHES.									
<i>England.</i>									
Barnsley ...		6.05	6.87	7.48	5.94	6.56	3.91	5.70	5.93
Blackburn ...		6.42	6.21	6.07	4.73	8.03	8.23	4.63	7.07
Blackpool ...		6.61	9.14	6.85	7.84	6.82	5.60	6.30	3.72
Bolton ...		5.23	4.37	8.20	4.39	4.12	4.43	3.06	8.04
Bradford ...		5.34	4.91	3.64	3.94	7.01	6.71	5.88	5.29
Bury ...		6.80	3.46	5.68	10.22	9.85	2.60	9.40	6.44
Darlington ...		5.02	2.76	7.92	6.98	4.72	—	6.14	6.64
Dewsbury ...		5.65	7.43	8.83	2.12	3.30	5.77	5.87	6.25
Halifax ...		6.25	4.61	4.05	4.91	5.72	7.47	10.25	6.85
Huddersfield ...		5.62	6.85	2.46	5.52	5.74	8.25	7.12	3.45
Oldham ...		6.79	6.88	3.36	5.76	4.81	11.10	9.78	5.85
Plymouth ...		5.35	3.86	6.66	5.22	3.30	7.43	6.04	4.98
Preston ...		5.86	4.95	6.02	5.98	6.96	4.76	6.27	6.10
Rochdale ...		6.96	5.03	2.07	10.86	5.72	11.01	4.81	9.26
Sheffield ...		5.50	3.92	4.43	5.04	5.66	6.92	6.28	6.26
Stockport ...		5.30	4.50	4.85	3.85	5.46	7.09	4.93	6.48
Wakefield ...		5.12	8.29	3.77	6.59	3.95	3.08	2.99	7.17
Wigan ...		6.44	5.35	7.51	4.82	5.64	5.40	6.06	10.33
<i>Wales.</i>									
Merthyr ...		5.92	4.49	5.04	6.11	3.91	7.13	9.79	5.02
Swansea ...		5.61	4.10	4.44	4.32	3.49	7.78	7.36	6.71

It will be observed that most of these places fall into groups, and that with few exceptions the highest maternal death rates are found in the West Riding of Yorkshire, in Lancashire and in Wales. It was, therefore, arranged for special enquiries to be carried out in these three districts by Dame Janet Campbell and Dr. Isabella Cameron, of the Ministry of Health, and Dr. Dilys Jones, of the Welsh Board of Health, respectively. These reports will shortly be issued by the Ministry of Health, but they have been placed at the disposal of the Committee which has had the opportunity to make use of them.

Before discussing the circumstances of special areas, it may be useful to survey the maternal mortality rates for 1929 in certain grouped areas.

	Maternal Mortality Rate.		
	Total.	Sepsis.	Other Causes.
<i>Group A.</i> —(London)	3.60	1.88	1.72
<i>Group B.</i> —(Home Counties)* :—			
Administrative Counties (6) ...	3.36	1.45	1.91
County Boroughs	3.58	1.67	1.91
Aggregate for Group	3.40	1.48	1.92
<i>Group C.</i> —(Rural England, Southern and Eastern Counties)† :—			
Administrative Counties (19) ...	4.06	1.60	2.46
County Boroughs	3.69	1.63	2.05
Aggregate for Group	3.95	1.61	2.33
<i>Group D.</i> —(Lancashire) :—			
Administrative County	4.88	1.60	3.28
County Boroughs	4.66	1.92	2.74
Aggregate for Group	4.74	1.83	2.91
<i>Group E.</i> —(Yorkshire, West Riding) :—			
Administrative County	5.24	2.27	2.97
County Boroughs	5.52	2.37	3.15
Aggregate for Group	5.39	2.32	3.07
<i>Group F.</i> —(Wales) :—			
Administrative Counties	6.18	2.23	3.95
County Boroughs	4.86	0.72‡	4.14
Aggregate for Group	5.89	1.90	3.99
<i>England and Wales</i>	4.33	1.80	2.53

* Bucks; Essex; Herts; Kent; Middlesex; Surrey.

† Berks; Cambridgeshire; Cornwall; Devonshire; Dorsetshire; Isle of Ely; Gloucestershire; Huntingdonshire; Lincoln; Norfolk; Oxfordshire; Soke of Peterborough; Rutland; Somerset; Southants; Suffolk; Sussex; Wight, Isle of; Wiltshire.

‡ This figure happens to be unusually low for the year 1929. The rate for the seven years 1923–29 is 1.77.

It will be seen that the maternal mortality rates in Southern and Eastern England, and in London and the Home Counties, are below the rates for the country as a whole, and substantially below those in Lancashire, Yorkshire and Wales. In Lancashire the total death rate is above the average, but the increase is almost entirely due to deaths from "other causes," and not from puerperal sepsis. In the West Riding and in Wales there is an increase in deaths under both headings.

In the first three groups the people are living in fairly well populated rural districts or under urban conditions which are not highly industrialised. In Lancashire and Yorkshire the towns are industrial and densely populated, and much of the country is given up to mining. In Wales the greater part of the country is either extremely rural, sparsely populated and inaccessible, or congested and industrial. Both these conditions—urban industrialism and a scattered population living in comparative isolation—are not infrequently associated with a high maternal death rate.

In Southern England we often find bad housing and overcrowded cottages, low wages and poverty, malnutrition and ignorance, but taking conditions as a whole working-class life is less harsh, and has greater amenity and comfort than in the crowded districts in Lancashire, Yorkshire and South Wales. The climate is more favourable; the housewife is less subject to a constant struggle with atmospheric dirt and dust, and there has been no such widespread failure of hygiene and nutrition as is indicated by a prevalence of serious rickets. The lower general death rate in the south suggests either a sturdier people or one which is less exposed to the incidence of disease, and the more favourable conditions would tend, indirectly at least, to reduce morbidity associated with childbirth. It is true that in some parts, for example, in the Isle of Wight, the maternal death rate is unexpectedly high, and careful enquiry fails to elicit an explanation, but this does not materially affect the general question.

It will be useful to review the conditions in Lancashire, the West Riding and Wales in somewhat greater detail. Both Lancashire and Yorkshire were, and to a considerable extent still are, agricultural rural counties; but the discovery of coal and iron and generally favourable conditions for the manufacture of textile goods during the eighteenth and nineteenth centuries led to an exceptional development and concentration of these industries and associated trades in the southern parts of the counties. As a result of the rapid expansion of urbanisation without previous planning or forethought, we find a dense population settled in an environment which is lacking in some of the essentials of a healthy life, and resulting in an independent, intelligent people bearing traces in its physical development of the long working hours, heavy labour, hardship and low wages experienced by earlier generations.

In Wales there are two counties, Glamorgan and Monmouthshire, which are highly industrialised, while the remainder of the country is largely rural and contains many districts which are thinly populated and of a hilly or mountainous character, so that there is little

intercourse between isolated families or villages. The same conditions prevail in Cumberland, another area showing a high maternal death rate.

The figures in the above table show that the excessive maternal mortality is due to complications of childbirth rather than to puerperal sepsis. In Lancashire puerperal infection is little, if at all, above the average, but in Yorkshire and in Wales (except for the county boroughs) the rate for puerperal sepsis, as for "other causes" of maternal death, is high. In the West Riding there is little difference in the sepsis rate in urban and rural areas, and the rate for "other causes" is notably high in the towns. The large amount of puerperal sepsis in rural areas in Wales, and also in the agricultural districts in Lancashire, is noteworthy, as this is contrary to the experience for the country as a whole. The death rate from "other causes" in the Welsh county boroughs exceeds even that of the West Riding.

Associated with the high maternal mortality rate there is in all areas a *still birth rate and a neo-natal death rate* which are above the average.

There is no constant relation between the *birth rate* and the maternal death rate, and a high rate of maternal mortality may be associated with a high or a low birth rate; nor has it any definite relation to the infant mortality rate apart from the neo-natal death rate.

Puerperal Sepsis.

This term covers a variety of conditions. In order to estimate its true significance it would be necessary to analyse it in terms of the primary cause upon which the septic infection was super-imposed, and this, unfortunately, is not possible. Septic infection due to abortion can be separated from other cases, and this should be done, as it is in a wholly different class from sepsis associated with the birth of a viable child. Abortion is evidently a factor of increasing importance, especially in certain industrial towns. We do not know what proportion of the remaining cases of sepsis follow, for example, a difficult labour or an exhausting haemorrhage, or an apparently normal uncomplicated delivery. Judging by the increased death rate from complications of midwifery, however, it is probable that the increase in puerperal sepsis is due mainly to difficult labour.

"Other Causes."

In inquiries of this kind it is impracticable to discuss fully the clinical and obstetric causes of maternal deaths. Medical Officers of Health in different areas furnished lists of deaths for definite periods with the causes given in greater or less detail. From these it is inferred that there is an excessive amount of difficult midwifery, much of which is probably due to disproportion caused by pelvic contraction. It is not possible on the available information to estimate to what extent or in what degree pelvic contraction exists among the women as a whole. Accurate pelvic measurements have not been made in a sufficient number of cases to justify any general conclu-

sions. We know, however, that severe rickets was formerly extremely common in the industrial towns of Yorkshire and Lancashire, and much of the present-day difficulty may correctly be attributed to the incidence of rickets a generation ago.

“The improvement of the general health is indicated by the almost total disappearance of that gross rickety deformity which was so common in all these industrial towns twenty or thirty years ago. There is probably still a good deal of minor rickets, and this is said to have increased again during the past year or two since poverty has become so very general. Pelvic deformity due to rickets, with consequent disproportion between pelvis and foetal head, is one of the obvious causes which suggests itself in explanation of a high death rate, foetal and maternal, from difficult labour. The improvement of the past twenty years has scarcely had time to affect women between 25 to 40 who are now bearing children. Enquiry into the work of maternity homes and ante-natal clinics failed to reveal any definite evidence of a high degree of pelvic contraction, and comparison is always difficult when data are incomplete.”

(West Riding report.)

The experience of Maternity Hospitals in Lancashire and Yorkshire suggests that cases of serious disproportion (often emergency cases in which no ante-natal advice had been obtained) are much more numerous than in central or southern England. The severely contracted rickety pelvis is certainly becoming much less common; the generally contracted pelvis often associated with stunted or defective development should also be less frequently met with as the general physique improves; but there is no evidence that the slightly flattened rickety pelvis is either more or less common than it used to be, and from the practical point of view disproportion due to slight contraction which may easily remain unrecognised until the onset of labour may actually have more serious results than a marked deformity associated with other rickety stigmata which is easily observed during pregnancy.

Rickets is the most common and ordinary cause of pelvic contraction with which we are familiar. Much can be done by ante-natal observation to prevent or control ill-effects arising from existing deformity, but the only prophylactic method of real value is the prevention of rickets in the infant and young child, and the encouragement of full pelvic development (by exercise, nutrition, etc.) in the growing girl. This question is referred to elsewhere.

Reference should also be made to an impression in the minds of practitioners with whom the question was discussed that there is a greater tendency to the occurrence of toxæmic conditions and of placenta prævia in Yorkshire, for example, than in Southern England, although this is not altogether borne out by the available figures which, of course, relate to mortality and not incidence. In certain areas, e.g. East London, the experience of Maternity Hospital and district practice suggests a low incidence of toxæmia. Experience abroad also suggests that toxæmia is particularly prevalent in certain places, and any future clinical investigation into the etiology and causes of toxæmia during pregnancy might usefully take account of the geographical distribution of the cases, and consider whether climate, water supply, living conditions, etc., have

any predisposing effect. The local investigation of individual maternal deaths will in time build up a body of evidence of the utmost value in deciding causation and suggesting means of improvement.

GENERAL CONDITIONS ASSOCIATED WITH A HIGH MATERNAL DEATH RATE.

In an area having a high maternal death rate attention is naturally directed to any outstanding local characteristics which may directly or indirectly have a bearing upon childbirth.

Rural Areas.

Mention has already been made of inaccessible and scattered districts. The predominance in these areas of causes other than puerperal sepsis suggests that the problem is largely one of transport and of making facilities for treatment which may already exist available for isolated homes. The remedy lies primarily in an improved organisation whereby more effective ante-natal supervision may be provided for women in rural areas, and arrangements made for adequate attention at the time of confinement at the home or in hospital. These women may properly be persuaded to come into hospital even if they have previously had normal confinements unless they can be sure of securing the services of a midwife, and, if necessary, a doctor without undue delay. In any event, a good ambulance service, including arrangements for a travelling midwife who can accompany the ambulance, is essential if occasional disaster is to be avoided. The increased use of the telephone, more generous provision of small motor-cars for district midwives, and a more intensive propaganda as to the value of ante-natal supervision, will all serve to bring patient and attendant into closer relationship, and do much to bridge the geographical difficulties of communication. Something is already being done, but in most areas the arrangements are too recent to have had any appreciable effect as yet, while in others the organisation is still wholly inadequate.

The Employment of Married Women.

In Wales there is little such employment, but in the industrial districts of Lancashire and Yorkshire the employment of married women in the mills is an obvious subject for inquiry. The processes assigned to women in the textile trades often demand skilled work, and throughout the history of the development of the cotton and woollen industries it has been the custom for many of the girls who enter the mills on leaving school to remain at work after marriage, at least until the claims of an increasing family oblige them to discontinue the double task. Has this question any bearing upon a high maternal death rate?

“ It is difficult to estimate justly the effect of this factory work on the maternal death rate. There are no adequate data as to the number of women who do in fact continue after marriage, or for how long they remain employed. Nor is it known how long women continue to work

during pregnancy, nor how soon they come back after childbirth. There is no welfare work in many mills, especially the smaller ones. Even where the welfare supervision of a factory is good, the welfare supervisor is usually a social worker with no special knowledge of midwifery, and as a rule she only becomes aware incidentally of the occurrence of pregnancy or of a miscarriage among the women. She does not usually keep any records dealing with these questions. The general impression is that the woman remains at work if she is well until her pregnancy becomes inconveniently noticeable, but not after the sixth or seventh month, and returns, if at all, two or three months after delivery. It is seldom practicable for a woman worker to attend an ante-natal clinic while she is still employed.

“The work in itself is not likely to be harmful to the pregnant woman; it is not unduly heavy; she is accustomed to it; the hours and conditions are reasonable. Standing may lead to some increased tendency to varicose veins or there may be some additional liability to abortion, but this is probably unimportant. The harm, if any, is likely to arise, as has often been pointed out, either because of the double strain of house work and factory work, or because of the inconvenience of keeping regular hours or of travelling to and fro under uncomfortable conditions when physical fitness is variable as so often happens during pregnancy. From a different point of view harm may ensue if the desire to retain employment leads to attempts to terminate an unwanted pregnancy. As regards physical strain, ordinary domestic work, including washing, mangling, lifting tubs and carrying water, is often more exacting than factory work is now, and a woman may be well advised to spend part of her earnings in paying for domestic assistance and to continue the outside employment. Unfortunately the need for money compels her too often to attempt both duties herself. When wages are low the mother may grudge herself the cost of tram fares, and may have little time for her own meals in the hurry to get her children fed. There may be considerable strain on the young daughter of an employed woman, as she may be obliged to undertake household tasks from a very early age.”

(West Riding report.)

“Neither can the high maternal death rate be attributed directly to the industrial employment of women which is so marked a feature of life in the county in normal times. There is no conclusive evidence that the employment of women in factories in Lancashire either before or after marriage has a direct effect on the loss of maternal life at childbirth. Lancashire towns with the highest maternal mortality rates are not exclusively those in which women are employed to a large extent in factories, while some towns with a relatively low rate have much industrial employment of women. At the same time the general experience is that the rate tends to be high in the cotton textile towns.”

(Lancashire report.)

It seems clear that work in the mills is not in itself necessarily harmful to the married woman, and it is only when combined with household duties that it is likely to prove injurious to an ordinary healthy woman. Moreover, it is only in certain of the towns under review that there is any substantial amount of regular employment among married women, while in times of widespread unemployment the married woman is one of the first to lose her work. But it is probable that the industrial development and the living conditions generally to be found in a manufacturing town have left their mark on the physique of men, women and children in these crowded districts, and that indirectly through malnutrition, rickets, stunted

growth, a lack of resistance and vitality, a desire for family limitation, and so forth, industrial conditions have affected, and continue to affect adversely the physical fitness of women for safe childbearing. It is this indirect and long-continued influence of a combination of factors rather than employment after marriage alone, which may lead to an excessive maternal death rate.

Housing.

As pointed out in the special reports, there is much overcrowding and bad housing in parts of all the towns and country districts under review.

“ Much of the housing accommodation is in the form of cottage property. Housing conditions are now, on the whole, fairly satisfactory, but in some districts they are poor. Most of the towns still suffer from the hasty and indifferent building of the days of rapid industrial expansion. Primitive sanitary arrangements existed for many years in some areas, and in some districts they have not yet been dealt with completely.”

(Lancashire report.)

“ There is much overcrowding and bad housing in parts of all these towns. There is a large number of back to back houses, often of a most unsatisfactory type (e.g., Dewsbury and Sheffield), and although new houses are being built fairly rapidly there are not yet sufficient to meet the needs, while the comparatively high rents may either prevent a family from occupying a modern house or make excessive inroads on a limited income with still further impoverishment of the dietary.

“ But although bad housing conditions may not materially affect the danger to life at the time of confinement, they may be definitely injurious to the woman's general health and thus predispose her to additional risk at childbirth. The inconveniences and insanitary atmosphere, the fatigue involved in maintaining cleanliness, in fetching water, and so forth, place an increased physical strain upon the mother. If the dwelling is dark or ill-ventilated or damp, the housewife who necessarily spends much of her time at home is often more likely than other members of the family to be prejudiced by such conditions. Moreover, it is very difficult for her to secure any real rest, mental or physical, after her ordinary work is done.’

(West Riding report.)

Generally speaking, there is no evidence that bad housing alone has an appreciable effect in raising maternal mortality, or morbidity in the uncomplicated case; but if any operative interference is necessary, an insanitary environment inevitably adds to the risk of septic infection and increases the need for removal to hospital. The effect upon the general health may also be prejudicial.

Unemployment and Poverty.

All the industrial towns under consideration have suffered greatly over a number of years from unemployment and consequent poverty. This has necessarily affected the general health and nutrition of the people. Anaemia and malnutrition not only unfit the mother for the strain of childbearing, but lower her resistance to sepsis and may predispose to disease during pregnancy. The lack of adequate nutritive value, including vitamin content, in the dietary is harmful to both mother and child.

“ There is evidence that in a large number of cases the diet of expectant mothers is inadequate. In the industrial areas it is to be expected, owing

to long continued unemployment or part-time employment, but deficient and inadequate diet appears to be just as much a feature of rural as of industrial life. . . . In the rural areas the mothers live far too exclusively on tea and white bread and butter. Any fresh farm or garden produce such as milk, eggs and fresh vegetables is sold, and the amount of these articles consumed at home is reduced to a minimum."

(Welsh report.)

"The general health among the women is said to be not markedly below the average, but it seems inevitable that a period of poverty and some degree at any rate of malnutrition must have affected their physical condition. The dietary of the people on the dole and earning low wages is necessarily limited and monotonous. There is ignorance of food values and money is not always spent to the best advantage."

(West Riding report.)

Attention to nutrition long before, as well as during, pregnancy is clearly of extreme importance, but malnutrition and the indirect effects of poverty do not in themselves explain the high maternal death rate which has in fact persisted in these areas for many years during periods of prosperity as well as adversity, for well-nourished as well as for ill-nourished women.

Rickets is a definite manifestation of defective hygiene and nutrition and is often associated with poverty. As already indicated, it has direct relationship to maternal mortality, but its influence upon pregnancy is only one aspect of its disabling effects. Its investigation and treatment as a morbid condition lie outside the scope of this inquiry.

The Necessity for a High Standard of Health among Young Women.

Consideration has been briefly given to the conditions of life in areas presenting special difficulties in the way of normal maternity. But one aspect of the problem is clearly fundamental and ultimate—namely, the standard of health and physical capacity of womanhood which may be favourable or unfavourable to normal pregnancy and childbirth. This point has been brought prominently to the notice of the Committee in the reports furnished to them on conditions in Denmark, Sweden and the Netherlands on the one hand, and in the industrial districts of Lancashire and the West Riding and the rural areas of Wales on the other.

We cannot expect a low maternal mortality rate unless the women subjected to the strain and stress of the physiological function of childbirth are themselves healthy and physically fit to undergo it. Such a proposition is obviously a truism, but, unfortunately, it is a truism which is widely unappreciated, and it exerts a profound influence on the whole problem of maternal mortality. An illustration occurs in the defective rearing of children which produces rickets in infancy, affecting the bones during the period of most rapid growth up to the end of the second or third year, and causes the rickety pelvis which constitutes one of the most serious complications of childbirth. Another disease which may profoundly affect the build of the child's body and its subsequent health is tuberculosis, whether in childhood or in

adolescent womanhood. Anaemia in young women is detrimental to the function of motherhood; so is rheumatic fever; so is venereal disease. Malnutrition and dental decay are obviously injurious, and the psycho-neuroses of urbanised life play their part in predisposing the pregnant woman unfavourably.

These are but examples of the broad fact that anything which impairs a sound physique and physiological muscular and bony development is prejudicial to a healthy pregnancy and normal childbirth. We are satisfied that, speaking generally, the women of the Scandinavian countries are often better equipped physically for the function of maternity than are the women of many of our great industrial communities. Their favourable physique is probably due to a complex of conditions, heredity, environment, hygiene, dietary (including a higher consumption of milk than in England), lower density of population, more rural life and occupation, etc. It is the whole physical upbringing of girls, in infancy, in school age, and in adolescence, to which we must give attention if we would lay enduring foundations of sound physique in women, enabling them to withstand the stresses and strains inseparable from pregnancy and maternity.

A healthy race of women does not grow by chance or caprice, nor is it assured by spasmodic and often ill-directed efforts of hygiene after adolescence. It is assured only by the systematic cultivation of the physiological life and obedience to physiological law from birth upwards. The problem of a high maternal mortality rate, especially in a time of rapid social development in an industrial and urbanized community, cannot be solved by any narrow or short-cut methods applied at the last minute. No intelligent community which disregards or is careless of the bodily health of its childhood and adolescent womanhood should be surprised if their physical and mental capacity fails satisfactorily to meet the natural demands of human life. It should not be assumed that Nature will allow us any latitude or exception, still less any mercy, if we ignore these matters. Yet there seems to be at the present day some tendency to assume that in spite of persistent and undue demands being made upon the physiological powers of the human body, all will be well. It is true that Nature is always on the side of natural and normal function, but Nature does not permit us to neglect the limitations and conditions of such functioning without exacting a penalty.

The Committee recognise that for a generation great efforts have been made by the State in behalf of the health of mothers and children, and of the individual generally—in maternity itself, in infancy, in the early years of childhood, in school life, even in the factory and workshop. They appreciate, too, the improvement in health which is following the steady reduction of rickets and tuberculosis. What they desire to emphasise is the necessity for the public recognition of the intelligent application and direction of *all* the medical services, and the vital relation which exists between them and the ultimate reduction of maternal mortality.

CHAPTER VII.

PUERPERAL SEPSIS.

The Committee called attention in its Interim Report to the arresting fact that 40 per cent. of the deaths which their investigators had found to be due to septic infection had followed normal labour. In the later series of deaths investigated the proportion was 50 per cent. Taking the two series together, this group of fatal infections following normal labour constitutes 18 per cent. of all the 4,655 deaths attributed directly to child-bearing.

Bacteriological investigation in the last few years (in Aberdeen, at Queen Charlotte's Hospital, in Glasgow and elsewhere) have made it clear that the great majority (not less than 85 per cent.) of these deaths from infection following normal labour are caused by streptococcus pyogenes (the "haemolytic streptococcus.").

The Committee wish to stress this point in order to present the problem in sharp focus.

Distribution of Infections by Streptococcus Pyogenes.

It is widely believed that septic infection following childbirth occurs much more frequently at maternity institutions than in domiciliary maternity practice. That opinion is, of course, a natural survival from the days when serious epidemics in maternity institutions were of frequent occurrence and alarming magnitude. It gains weight also from the fact that the major obstetric difficulties are dealt with in hospitals and naturally carry a high death rate from infection. It has also received support in recent years—rather unfortunately, perhaps—from the publication of the "Aberdeen Report" of 1928, which analysed the maternal death rates occurring in the practices of doctors, midwives and institutions of that city.* The analysis showed a death rate from puerperal sepsis of 1·0 per 1,000 in the practice of midwives, 1·7 in the practice of doctors, and 4·5 in in-patient institutional practice (pp. 13-14). The high institutional rate is frankly ascribed to the influence of "gross contagion" (p. 20).

The Committee think that it would be unfortunate if this analysis of conditions in Aberdeen should be too hastily assumed to apply to the whole country, for evidence is available which suggests a different conclusion. As stated in the Interim Report (p. 50), "the majority of deaths from puerperal sepsis do not occur in epidemics—but in single or 'sporadic' cases."

To this may be added the fact that the committee's investigation did not show that the proportion of deaths from sepsis following normal labour was any higher in cases attended in hospital than in those attended in their own homes.

* Maternal Mortality. J. Parlane Kinloch, M.D., J. Smith, M.D., D.Sc., and J. A. Stephen, M.A., M.B. Published by the Scottish Board of Health, 1928.

When due attention is concentrated upon these predominant sporadic infections—and upon the incidence rather than upon the death rate (which is apt to be influenced by other factors)—the case bears a somewhat different aspect. In three large centres of maternity work, viz., Queen Charlotte's Hospital, the Elsie Inglis Hospital in Edinburgh, and University College Hospital, London, it has been the custom for the last two or more years for all pyrexial cases occurring both in the hospital and in the out-patient (domiciliary) practice to be bacteriologically investigated as soon as they occur. In each centre it has been found that the incidence of infections by haemolytic streptococci has been consistently higher (more than double) among the women delivered at home than among those delivered in the hospital; and this in spite of the fact that on the "districts" only normal, "booked" cases are dealt with, whereas in the hospital "emergency" and abnormal deliveries are also undertaken, and opportunity for "contagion" is frequently present.

While, therefore, the Committee are fully alive to the continual threat of contagious infection in maternity hospitals, and would emphasise the need for constant vigilance and improved methods of avoiding it, they take the view that this is not the outstanding cause of infection by the streptococcus haemolyticus or of septic infection following normal labour.

Already there is evidence that the work of a maternity hospital can be conducted with a negligible amount of infection by haemolytic streptococci. At the Obstetric Unit of University College Hospital, London, during two and a half years in 1929, 1930 and 1931, about 2,500 patients were delivered. The records of the careful bacteriological investigations carried out on every febrile patient show that only five cases, and four of them mild ones, of infection by haemolytic streptococci have occurred during this period.* And the results obtained by several other maternity institutions, for example, the East End Maternity Hospital, the British Hospital for Mothers and Babies, Woolwich, and the Jewish Maternity Home, Stepney, where no routine bacteriological investigations are undertaken, but where there has been for several years a total maternal mortality rate for hospital and district cases of well under 1 per 1,000 births, point strongly in the same direction. It is practically certain—in view of the well-known high mortality rate of infections by haemolytic streptococci—that such satisfactory results could not have been obtained unless these infections were of rare occurrence.

While it seems clear, therefore, that normal maternity work on a considerable scale can be carried out—and is actually being carried out—with an extremely small expectation of serious sepsis, it is also unfortunately clear that it is not always being so carried out.

In seeking an explanation for this inequality in the distribution of puerperal sepsis, the Committee have reconsidered all the avail-

* Personal communication from Mrs. Taylor, a bacteriologist working at University College Hospital with a grant from the Medical Research Council, whose report will be published very shortly.

able data bearing upon (a) the sources of infection, and (b) the appropriate preventive measures.

Sources of Infection.

Infection by Streptococcus Pyogenes.

Since the publication of the Committee's Interim Report, new evidence has been forthcoming as to the origin of the infections by streptococcus pyogenes.

In the first place, there is confirmation of the two important facts ascertained by Professor Hedley Wright and Mrs. Taylor* at University College Hospital, London, viz.:—That about 27 women per 1,000 harbour these streptococci (indistinguishable from those of puerperal fever) in the genital tract at the onset of labour, and that the great majority of these genital-tract "carriers" have a perfectly normal puerperium. At the Elsie Inglis Hospital in Edinburgh the proportion of such carriers was similar, viz.:—Forty-one cases in 1,221 women examined at the onset of labour; only two of the 41 had puerperal pyrexia attributable to genital infection by haemolytic streptococci.†

It appears, therefore, that the haemolytic streptococci native to the genital tract (or temporarily lodged there) are usually unimportant as sources of puerperal fever. Conversely it may be said that the infections that do occur (at any rate, the sporadic infections) cannot usually be attributed to invasion of the genital tract tissues by haemolytic streptococci present in the vagina at the onset of labour. They might, however, be due to streptococci conveyed to the genital tract from another part of the mother's body, e.g., by the blood stream, from her respiratory tract, intestine or a hypothetical internal focus such as the gall bladder, or by the mother's fingers, from her throat and nose, gums or skin.

That such a transfer of potentially pathogenic streptococci may, and indeed does, sometimes occur is very probable, but in face of the bacteriological evidence that in most of the cases of puerperal infection by haemolytic streptococci these organisms can *not* be isolated from the patient's throat, nose or gums; that they do not persist on the human skin for any length of time (Colebrook, 1930),‡ and that they are rarely found in human faeces, the Committee regard it as very unlikely that the majority of these infections are due to streptococci native to the patient's body. One further item of evidence in support of that conclusion may be mentioned here. Of 20 cases of puerperal pyrexia due to genital infection by haemolytic streptococci among the in-patients and out-patients of the Elsie Inglis Hospital in Edinburgh, 18 had been found to be free from

* Wright and Taylor, 1930, J. of Obs. and Gyn. of the British Empire. xxxvii. 2.

† Information derived in part from the privately circulated Bulletin of the Hospital, and in part from personal communications, for both of which the Committee is indebted to Dr. J. K. Rose and Mrs. Johnston.

‡ Interim Report of the Departmental Committee on Maternal Mortality and Morbidity; Appendix D. August, 1930.

that organism when swabs from the throat and vagina were examined at the onset of labour.

Turning now to the hypothesis that the pathogenic haemolytic streptococci are frequently, if not usually, transferred to the woman in childbirth from a source outside her own body, the Committee are impressed with the steady growth of evidence in support of that view. That such microbes are actually sprayed into the air by coughing, sneezing, shouting, or even talking, by those who carry them in the throat or nose, is no longer in doubt. That they may sometimes actually produce puerperal infection was first shown, almost conclusively, by the two cases of pneumococcus infection reported by Professor Hedley Wright and Miss Nixon,* and referred to in the Interim Report. That pathogenic streptococci are frequently transferred from the throat or nose of someone in attendance upon women in childbirth is very strongly suggested by the important work of J. Smith in Aberdeen.† Dr. Smith attempted to determine, in a series of 18 cases of puerperal infection by haemolytic streptococci, whether the cocci recovered from the patients during their fever could be identified with similar streptococci recovered either from an extra-genital source in the patient's body or from the throat or nose or hands of a "carrier" attending her. For this purpose he departed from the serological procedure usually adopted for the identification of streptococci, and employed the more refined process of "absorption of agglutinin." By this method he was able to satisfy himself that in one instance the patient's uterine streptococcus was identical, and very possibly derived from that in her nose; in another instance the uterine strain was identical with that of the mother's injured finger; *while in no less than 12 cases the uterine strain was identical with that derived from the throat or nose of a doctor, nurse or student in attendance upon her during labour.* In one case there was identity with a strain obtained from the doctor's thumb.

Dr. Paine in Sheffield,‡ employing similar methods, was able to show that the streptococci infecting two puerperal cases were identical with that obtained from the throat of a nurse in charge of them, and his record is of particular interest in that the nurse in question was not on duty till two hours after the delivery of one of the patients. Her infection presumably occurred, therefore, during the post-natal treatment. It seems probable that such infection after delivery is a not uncommon occurrence, and may well account for some of the instances in which puerperal fever follows a perfectly easy spontaneous labour in a patient who has had no vaginal examinations at all. Cases of this kind are constantly cited as striking examples of necessarily autogenous infection, especially if the delivery has actually occurred before the arrival of doctor, nurse or midwife. It should be borne in mind by those who reason in this

* Lancet, 1929, i., 1242.

† Report issued by the Department of Health for Scotland. Causation and Source of Infection in Puerperal Fever, by J. Smith, M.D., D.Sc., M.R.C.P. (Lond.), D.P.H.

‡ British Medical Journal, 1931, ii., 1082.

way that such a precipitate labour creates exactly the situation in which an over-anxious-to-help friend or neighbour, with no understanding of surgical cleanliness, may easily sow the seeds of infection. And the instance cited above (Paine) suggests that even a hospital-trained nurse, happening to have pathogenic streptococci in her throat, may be the quite innocent cause of such a post-natal infection.

The Committee feel that it would be premature at the present time—in view of the intricacies and technical difficulties involved in the identification of streptococci—to formulate any definite statement with regard to the aetiology of the puerperal infections by that organism. At the same time they are of opinion that the evidence now available so strongly supports the conception that droplet infection from the throat or nose is a serious menace in maternity work that it behoves all those engaged in that work to adopt such measures as are calculated to avoid the danger.

The present position may be tentatively stated as follows:—

- (a) A large number—perhaps the majority—of infections by haemolytic streptococci are due to transfer of the microbes from the throat or nose of someone in attendance upon the mother in childbirth or the puerperium. This transfer may occur by droplet spray directly on to the vulva and vestibule, but probably is more often effected indirectly, i.e., by way of the accoucheur's hands, or instruments, or dressings.
- (b) In other cases—probably a minority—the infecting streptococci are conveyed by the mother's fingers from her throat or nose to the vulva.
- (c) In a very small number of cases the haemolytic streptococci originally present in the genital tract are probably responsible for the infection.
- (d) Many of the throat-carried streptococci are probably harmless, being, like those native to the vagina, in a permanently avirulent condition—but there is at present no simple means of ascertaining this with certainty in any individual case. All known carriers must therefore be regarded with suspicion, although not with alarm.
- (e) There is clinical evidence for regarding the carrier with signs of infection, e.g. "sore throat," or definite tonsillitis, or antral infection, as much more dangerous than the intermittent carrier who is habitually quite free from such infections.

This summary shows, upon reflection, that there are many important questions bearing upon the aetiology of puerperal infection by haemolytic streptococci which can only be completely answered by further combined epidemiological and bacteriological investigations. The data at present available are scanty. In the Interim Report it was stated that "on the suggestion of the Committee arrangements for affording advice and assistance on the bacteriological investigation of outbreaks of puerperal sepsis are under con-

sideration by the Ministry of Health and the Medical Research Council.”* As an outcome of that joint consideration it was decided that arrangements should be made to carry out such investigations at a central laboratory at which suitable agglutinating sera for identifying types of streptococci would be available and that a full-time bacteriologist should be appointed for this special work. Dr. Dora Colebrook was recently appointed by the Medical Research Council to undertake this work, which is being carried out at the Queen Charlotte’s Hospital laboratories at Hammersmith. In a circular letter to Medical Officers of Health (see Appendix) the Ministry has made it known that, in the event of any outbreak of puerperal sepsis, swabs from patients and contacts may be sent direct to Dr. Dora Colebrook for examination and, whenever possible, identification of any haemolytic streptococci which may be present. It is hoped that, as this investigation develops, the responsibility of the throat carrier for puerperal infections will become more clearly defined; the prevention and control of epidemic infections in Maternity Homes and Hospitals will be facilitated; and help will often be forthcoming in regard to the perplexing problem which arises when a midwife or nurse is suspected of giving rise to these infections. Perhaps, also, it may become possible to distinguish between the dangerous and the harmless carrier.

The investigations of Dr. Smith in Aberdeen and of Dr. Paine in Sheffield are also continuing along the same useful lines.

In concluding this summary the Committee would point out that if, as the evidence quoted suggests, the majority of the infections by haemolytic streptococci are due to transfer of the streptococci to the genital tract from a source outside the patient’s body (or sometimes from her own mouth), *these infections must be regarded as avoidable* by a judicious tightening up of our preventive measures. On this view not only most of the deaths from infection which followed normal labour (18 per cent. of the total deaths from all causes), but a considerable number, also, of those which ensued upon abnormal labour, could have been prevented.

Infection by anaerobic streptococci.—The fact that these streptococci have been recovered from the blood of a large number of cases by Schottmuller† and others in Germany, from 36 cases by Dr. L. Colebrook and his colleagues at Queen Charlotte’s Hospital during the past 3 years, and from several cases also by Schwarz and Dieckmann in America‡ makes it clear that they rank second only in importance to the aerobic species, *Streptococcus pyogenes*, in the causation of puerperal fever.

The source of the infections by these anaerobic streptococci has not yet been definitely established, but there is strong presumptive evidence that they are usually endogenous in origin. Cocci indistinguishable from those isolated from the blood are found to be

* Interim Report of the Departmental Committee on Maternal Mortality and Morbidity, p. 48.

† Ref. Münch. Med. Woch. 1911: 581, 557. 1928: 75 ii, 1580 and 1634.

‡ Ref. 1927 Amer. Journal of Obstetrics, xiii., 467.

present in at least 30 to 40 per cent. of women at the onset of labour,* and there is a very close relationship between the incidence of these infections and internal manipulations during delivery. Thus, of the 36 septicaemic cases investigated by Dr. Colebrook and his colleagues, no fewer than 23 had had 'some form of obstetric interference per vaginam (10 of them manual removal of placenta).

While, therefore, the view may be tentatively held that most of these infections are initiated by the organisms native to the vagina, the possibility of their transfer from a throat carrier cannot at present be excluded.

Infection by Bacillus coli.—There is little doubt that the colon bacilli causing puerperal infections are usually those strains which were present in the mother's intestinal or urinary or genital tract at the time of labour. In 6 cases investigated by J. Smith,† in which this organism was recovered from the uterine swab in puerperal fever, the strain could be identified by serological reactions with that present in the patient's rectum or urine. Whether they sometimes reach the genital tract by way of the blood stream is not known at present, but there would seem to be little reason for supposing that this is a common event.

Preventive Measures.

From what has been said above it will be seen that the dangers which have to be guarded against include :

- (1) Transfer of pathogenic organisms—chiefly haemolytic streptococci and pneumococci—from the throat or nose of an attendant or the mother herself, either by direct droplet infection, or indirectly by the hands, etc.
- (2) Transfer of pathogenic organisms (chiefly haemolytic streptococci) from another infected patient by the attendant's hands, instruments, etc.
- (3) Endogenous infection by microbes in the genital tract or reaching it by way of the blood stream.

It appears that the method of obstetric toilet in common use for the last 20 or 30 years, viz., thorough washing of hands and of the vulva and perineum, with subsequent application of antiseptic lotions to both, and the use of sterilised dressings, which has been the basis of the great success obtained on the whole in the avoidance of septic infection, breaks down from time to time because it does not take into account the possible danger from throat-carried streptococci and droplet spray. If, as the evidence suggests, the latter danger is of major importance, there is no escaping the conclusion that our preventive efforts have in the past been too exclusively directed to the prevention of infection from other sources and should be revised. For droplet infection is a danger which can be countered, to a large extent, by the use of efficient masks, and there would seem to be no

* Ref. (Rosowsky, Zent. f. Gyn, 1912, 36, 7), and also unpublished work at Queen's Charlotte's Hospital.

† Ref. ante.

adequate reason why a practice which has long been adopted in operative surgery should not be brought into general use in maternity work. Indeed, the Committee believe that public opinion will, in a very short time, demand this elementary safeguard.

In making this and other recommendations, such as the use of rubber gloves (*vide infra*) the Committee are fully aware of the fact that in some maternity institutions where neither masks nor gloves are employed, a very low sepsis rate has been maintained over a number of years. At first sight this fact would seem to show that the danger of infection from throat carriers cannot be a serious one. On reflection it will seem to weigh equally against the danger of endogenous infection, since in these successful institutions, beyond a thorough toilet of the vulva, no attempt is made to sterilise the genital tract, and the risk of infection by the blood stream—whether great or small—must be assumed to be an approximately constant factor.

The probable explanation of the success of these institutions would seem to be that in the administration of their maternity services there is attained an exceptionally high standard of organisation, of expert supervision and of individual effort; and simple measures are adopted, which serve—perhaps without being consciously directed to that end—to avoid the danger of infection from the occasional throat carrier. In one such institution where close enquiries were made it was found that silence was enjoined in the labour wards, except in so far as teaching was required (and this is done in a low voice). In the same institution nurses are instructed that they should not bend over the patient at whose delivery they are assisting. In this way the danger of direct droplet infection of the vulva is no doubt minimised. Frequent re-sterilisation of the hands in perchloride of mercury is also insisted upon (and carried out) in this institution; and vaginal examinations, although they may be made on several occasions before the membranes have ruptured, are not allowed after that event unless in exceptional circumstances.

It is probable that better organisation, supervision and discipline, with stricter attention to the essentials of technique, might yield the same results in other centres of maternity work, but it is clear that up to the present, in spite of the will to obtain them, and the adoption of apparently similar methods, these results have not been generally obtained. The human factor is, perhaps, more often responsible than any other for the infections which occur. In these circumstances the Committee feel justified in urging the wider adoption of measures which are calculated to give a greater margin of safety without any large addition to the cost. These measures are as follows:—

The Use of Masks.—These should be worn over both nose and mouth by all those in attendance upon the patient, and by any other persons present. Opinions differ as to what is the best type of mask, but it can be frankly stated that many of those employed in surgery are of such wide mesh as to be of very little use. A

comfortable, and also efficient, type is that made of not less than four layers of butter muslin of a mesh not less than 40 x 40 threads per inch, and measuring 8 by 5 inches. Another, just as efficient, is made of fewer layers, but incorporates a piece of impervious material, such as thick paper, about 4 inches square, which is inserted through an aperture along the upper edge. Four tapes secured to the corners and tied respectively above the ears and (loosely) round the neck, provide the cheapest and simplest method of attachment. Masks made entirely of an impervious material such as thin mackintosh are perhaps still more efficient, but they have proved less comfortable to wear and, if worn for any length of time, may be a source of danger owing to the accumulation of droplets of moisture which tend to run down and drop off the lower edge.

It cannot be too strongly emphasised that all masks if touched by the wearer may be more a danger than a safeguard. The mask should be handled by the tapes only; after removal it should be placed in antiseptic solution until it is again washed and boiled for future use. Instruction of nurses on this point is particularly necessary.

To be effective in the prevention of droplet infection, the use of masks should not be limited to the actual time of delivery; they should be worn whenever any local treatment is carried out, shortly before or during the labour, and also during the first three or four days of the puerperium. Moreover, they should be used just as much in domiciliary as in hospital practice.

In making recommendations for an extended use of masks, the Committee are not ignoring the great practical difficulties in the way of their general adoption, particularly by midwives in domiciliary practice, nor the dangers in their use by imperfectly instructed persons to which reference is made above. They realise also that many points concerning droplet infection, which is at present the subject of intensive research, are not yet fully understood. But the existing evidence is, in their opinion, of sufficient weight to justify an extended trial of a method which offers a hope of prevention of some of the cases of virulent and disastrous septic infection (many of which are found in their series of deaths) which occur in healthy women after normal labour with no known source of infection, and no apparent failure in the ordinary antiseptic precautions.

The Use of Rubber Gloves.—Reasons for recommending these and methods for using them in maternity work are discussed at length in the following section of this chapter which deals with antiseptics in midwifery.

The essential part to be borne in mind by all those engaged in maternity work is that, in view of the probability that imperceptible droplet infection is a serious danger, the hands should *always* be suspect, and not only when they are known to have touched some contaminated surface. Recognition of this will demand much more scrupulous antiseptic toilet of the hands than has been usual heretofore.

Other Measures for the Avoidance of Droplet Infection.—Talking in the place of confinement should be actively discouraged. In so far as it may be necessary for teaching and for the encouragement of the patient it should be done in a low voice with the lips nearly closed. Coughing and sneezing, when they cannot be avoided, should be done outside the room if possible. Nurses and midwives should be instructed as to the danger of direct droplet infection of the vulva by bending over it. Vaginal examinations should never be made in a straightforward case after the membranes have ruptured. Visitors to maternity wards should be limited in number, and excluded where there is reason to suspect any infective condition.

Those in attendance upon midwifery cases, whether doctors, nurses, students or domestic helpers, should, whenever possible, discontinue such attendance immediately on the occurrence of a sore throat or a definite tonsillitis or antral infection. So far as practicable such individuals should also cease to mix with the staff of a maternity institution, and should be bacteriologically examined. If they are found to be free from haemolytic streptococci or pneumococci—and circumstances demand it—they may resume their midwifery work, but should be scrupulous in the use of masks and an efficient toilet of the hands.

Those engaged in midwifery work who are found to be intermittent carriers of small numbers of haemolytic streptococci but have no signs of throat or antral infection should be allowed to continue their activities, but under warning as to the necessity for strict observance of all precautionary measures. Other individuals who habitually carry a large number of haemolytic streptococci in the throat should, whenever possible, discontinue midwifery work while this condition lasts. If that is not possible they should be under close supervision.

There is at present no clear evidence that the inoculation of a vaccine, or the use of gargles, will serve to get rid of the haemolytic streptococci from such a carrier's throat—but in a persistent case the removal of tonsils should be considered. Gargling with antiseptics strong enough to irritate the mucous membrane is to be deprecated as likely to prolong the carrier state.

When an outbreak of epidemic puerperal fever occurs in a maternity hospital, it is desirable that the whole staff should be swabbed without delay. If only one or two individuals are found to be carrying haemolytic streptococci they should be sent away immediately and re-swabbed at intervals of a few days. Delivery rooms and lying-in wards should then be disinfected as soon as they can be emptied.

If, as sometimes happens, a considerable proportion of the staff is found to be harbouring haemolytic streptococci in large numbers, more drastic steps should be taken at once. The risk of continuing to deal with maternity cases in such circumstances is very great, even with the most strict observance of precautionary measures, such as the use of masks and gloves. The only safe course for such a hospital is to empty the wards, and disinfect the whole building as far as possible—at any rate the delivery rooms, lying-in wards, and nurses'

quarters—and to start afresh with a staff known to be free from carriers. The carrier state in the staff originally affected will usually not last very long.

The Prevention of Endogenous Infections.

It appears unlikely (vide infra) that attempts to sterilise the genital tract by means of antiseptic substances will meet with much success; and there is an appreciable risk that the application of such substances may do more harm than good by interference with the natural protective mechanisms.

Thorough washing of the vulva, vestibule and perineum, with subsequent application of a non-irritant antiseptic, should, however, serve in some measure to prevent organisms derived from the rectum or urinary tract being carried into the vagina and uterus.

For the rest, the avoidance of these endogenous infections must depend chiefly—unless it eventually becomes possible to immunise against them—upon the avoidance and better management of obstetric difficulties; in a word, upon the evolution of mothers better equipped for childbirth and of a higher standard of midwifery work.

Antisepsis in Midwifery.

In relation to the observations set forth above as to the causation and prevention of puerperal sepsis, the Committee have thought it important to give detailed consideration to the antiseptic methods in use in midwifery. They believe there is abundant evidence of defects in the day-by-day practice of antisepsis, that the human factor is frequently and gravely at fault, and that the solutions employed and the method of their preparation and use are often ineffective.

The Committee feel it to be their duty to call attention emphatically to this state of affairs, and they have attempted to formulate some definite procedure for the guidance of those undertaking maternity work.

They recognise that no rigid routine can be specified for all cases. Varying facilities for steam sterilisation necessarily lead to modifications of method; differences in the skin susceptibility of individuals must be recognised; questions of expense cannot be ignored, and, above all, the required ritual must be sufficiently simple to be carried out by doctors and midwives in domiciliary practice.

The ideal programme of antisepsis for childbirth would prevent any pathogenic microbe reaching the placental site, or any bruised or lacerated tissues, both during and after labour. To effect this it would be necessary, at the commencement of labour, to eliminate from the genital tract the potentially pathogenic microbes present at that time and to keep the tract free from these microbes during the whole course of labour and for several days after; it would provide for the sterilisation of the water with which the patient was washed at the beginning of labour, and for the sterilisation of the hands of those assisting at the delivery, and also for the sterilisation of instruments. Finally, it would continue such of these preventive measures as were appropriate for at least three days after delivery.

Probably part of this ideal programme is impossible of achievement. It is unlikely that any antiseptic applied to the mucous membrane will eliminate pathogenic microbes if they are established in deep crypts and glands of the cervix and vagina, and the possibility should be borne in mind that by interfering with the normal secretion, which is known to be unfavourable to most of these microbes, actual harm might be done. This matter is referred to above.

Again, it is practically certain that antiseptics will fail to kill pathogenic bacteria at the termination of labour when the whole genital tract is bathed in blood and serum. They will fail then for two reasons. First, because the microbes at that time—if not already in the tissues—are to a large extent caught up in the meshes of blood clot, and no antiseptic can diffuse into clot in a concentration sufficient to kill microbes unless it is present for a long period in very high concentration in the serum bathing the clot—a condition which cannot be maintained in the genital tract because of the constant outward stream from the placental site. Secondly, antiseptics will fail in these circumstances, because all of them, when brought into contact with undiluted blood and naked fixed tissue cells such as those of the placental site, will combine with the great mass of those blood and tissue cells and in so doing forfeit their power to combine with and kill the relatively negligible mass of microbes. The experiments of Fleming have established the truth of these statements. Not only will the antiseptics fail when used in these unfavourable circumstances, but they will probably often do harm. For it has been clearly shown* that in contact with blood most of the antiseptics destroy the leucocytes, upon the activity of which the bactericidal efficiency of the blood chiefly depends. There can be little doubt that the mother's best chance of escaping infection lies in the imprisonment of any microbes in blood clot and their destruction there by the agency of leucocytes. Although it sometimes fails, the blood, with its migratory cells, mobilised in the infected tissues and in the clots, is always more likely to succeed than an antiseptic introduced from without. Antiseptic procedure in midwifery should therefore limit itself to keeping the vulva and perineum as far as possible free from pathogenic bacteria, and to preventing the transfer of such bacteria, in particular of haemolytic streptococci, from any outside source to the genital tract.

The present-day practice of midwifery cannot be relied upon to achieve these results. The water used for washing the vulva is usually not sterilised; the soap is seldom self-sterilising, and may have been contaminated by pathogenic organisms; the naked hands which do the washing are not sterile. The sterilisation of the vulva and perineum, with their dried secretions and discharges, must often be imperfect. Mechanical cleansing of these parts by soap and water cannot be as thorough as in the toilet of the hands, and bacteriological tests have indicated that it is more difficult to elimi-

* Ref. Fleming, Proc. Roy. Soc. B., 1924, vol. 98.

nate streptococci from the vulva than from the skin of the fingers.* It has been shown that on the hands of those conducting the delivery, if ungloved, many staphylococci and diphtheroid bacilli persist, and, what is more serious, the hands after the usual disinfecting process are not protected against contamination by haemolytic streptococci (vide experiments infra) reaching them, for example, by droplet spray from the mouth or nose.

To sum up this indictment—the procedure of to-day leaves open many possible avenues by which infection may be conveyed. It cannot be relied upon to eliminate haemolytic streptococci and other pathogenic organisms from the vulva; unless very conscientiously carried out it may not eliminate these streptococci from the accoucheur's hands; and it offers no continuously acting chemical barrier against infection during the long course of labour.

The recommendations which follow do not pretend to any finality, but it is believed that they offer a greater margin of safety than the practice employed hitherto. They are based upon experimental work reported in Appendix D of the Committee's Interim Report dealing with the sterilisation of the hands, and upon other experiments bearing upon the possibility of a continuously acting chemical barrier for the mother.

Treatment of the vulva and perineum before delivery.

The chief task here is the removal of microbes incorporated in dried secretions and discharges. Systematic and prolonged scrubbing of the *hands* is universally recognised as essential; but perhaps it is not so generally appreciated that the cleansing of the vulva with soap and water must be at least as systematic and prolonged. Of all the means at our disposal thorough mechanical cleansing of the skin by soap and water has been found to be the most effective for this purpose, and it is of the greatest importance that everyone attending cases of labour should clearly understand that no antiseptic is effective in freeing the vulva from microbes unless this has been first employed. The application of an antiseptic afterwards should be regarded as the final setting up of a chemical barrier for as long as possible against any subsequent infection.

Experimental work which is summarised below has shown that iodine may be expected to fulfil this function better than any other antiseptic tested up to date.

The experiments were of three kinds, as follows: (a) the skin of the middle phalanx of one or several fingers was infected with a very thin film of pus containing †virulent haemolytic streptococci and was left to dry for half an hour. The antiseptic was then applied, the skin being thoroughly wetted with it for two or more minutes and then allowed to dry. After half an hour—or sometimes a shorter period—the infected

* These and all other bacteriological tests referred to in this section of the Report have been made by Dr. Leonard Colebrook at Queen Charlotte's Hospital Research Laboratories, Hammersmith, and will be reported later in detail in one of the Medical Journals.

† It is evident that virulent streptococci could not be used, but there is no evidence that virulent strains are more resistant to the germicides used in these experiments than are avirulent ones.

skin area was rubbed with a small moistened gauze swab which was immediately thrown into 20 c.cm. of a suitable diluting fluid in order to eliminate, either by dilution or neutralisation, any further antiseptic action. A control area of skin, similarly infected but not treated with the antiseptic, was swabbed in the same manner. The number of haemolytic streptococci and other microbes surviving in each tube of diluting fluid was determined by explanting measured volumes in melted blood agar.

(b) Similar experiments on the skin of the vulva of patients who were discharging pus containing haemolytic streptococci from the uterus. A drop of pus was spread thinly upon both sides of the vulva, and after this had dried one side was treated with the antiseptic under test, the other serving as the control.

(c) In order to find out how long the skin, treated by antiseptics, remained immune to a fresh infection by streptococci, the procedure described above in the finger experiments was reversed. The antiseptic was first applied, and at appropriate intervals after a drop of pus was spread, in a very thin film, on the treated area. A swab taken half an hour later, and compared with that from a similarly infected, but untreated, finger showed whether the streptococci had been able to survive on the treated skin.

The results obtained with the different antiseptics were as follows:—

Lysol. 1 in 160.

Exp. (a) The haemolytic streptococci were not completely killed.

Exp. (c) Half an hour after disinfection of the skin (washing plus soaking for 3 minutes) it was almost as easily re-infected as the control skin.

Perchloride of Mercury. 1 in 1,000.

Exp. (a) The haemolytic streptococci were not completely killed.

Exp. (c) Ten minutes after disinfection (washing plus 3 minutes soaking) it could not be re-infected by streptococci, but after half an hour a considerable number of streptococci were able to survive on it.

Monsol in Adeps Lanae 5%.

Exp. (a) Streptococci were not killed after 30 minutes' exposure to the ointment.

“*Blue Paint,*” i.e. *Brilliant Green and Crystal Violet.* (1 in 200 of each.)

Exp. (a) The killing of haemolytic streptococci was complete after 30 minutes, but not quite complete after 17 minutes.

Exp. (c) One hour after application of the dyes—although the skin was deeply stained—many streptococci were able to survive on it.

Iodine (2% aqueous solution in potassium iodide).

Exp. (a) Haemolytic streptococci were completely killed in 10 minutes.

Exp. (c) For all periods up to 6 hours the skin could not be re-infected, the streptococci being always killed off within 15 minutes.

Iodine Ointment (5% in paraffinum molle).

Exp. (a) Haemolytic streptococci were completely killed after exposure to the ointment for 30 minutes (shorter periods not tried).

Experiments of the (b) type showed that both the watery solution of iodine and the ointment were successful in eliminating streptococci from the vulva on two occasions when the infection of the skin was not very large; and nearly successful on another occasion when there was a very heavy infection.

These results appear to justify the conclusion that iodine not only kills haemolytic streptococci on the skin, even when these are incorporated in a dried albuminous medium such as pus, more rapidly than any other antiseptic tested up to date, *but also renders the skin insusceptible to infection by these streptococci for a period of several hours.*

Both these properties would make it peculiarly suitable for use as the sole antiseptic in the preparation of the vulva and perineum were it not that it has been found to have an irritant action in a certain number of patients, especially on repeated application. Occasionally there may be a pronounced idiosyncrasy to it, and in such cases even a single application may cause a troublesome dermatitis. In these circumstances the Committee have not felt it practicable to make an emphatic recommendation as to the antiseptic toilet for the mother. It is to be hoped that further investigation of the properties of antiseptic substances will reveal one which has the virtues of iodine without its occasional irritant effects.

The following procedure is suggested as being worthy of an extended trial, since it offers rather a larger margin of safety than those at present in general use.

After the vulva has been shaved or the hair closely cut, the labia majora, the perineum, the vestibule and the labia minora, with a wide area of surrounding skin, should be thoroughly washed with warm sterilised water (*vide infra*) and soap which is known to be bactericidal for haemolytic streptococci and *B. coli* (*vide infra*). This preliminary washing should be done with gloved and sterilised hands, and care taken to avoid any contamination of the water employed by the return to it of used swabs or the washing hand. (One hand should take swabs out of the sterile water for transfer to the washing hand.) The washed surfaces are then dried with a sterile or perfectly clean towel and aqueous iodine (2%) is applied with a swab to the vulva and perineum but not to a large area of skin. Whenever practicable 10 minutes should be allowed to elapse after the application of the iodine before any internal examination or manipulation is made.

If the case should be prolonged and further internal examinations or manipulations are necessary, the application of iodine may be repeated, provided that at least 4 hours have elapsed and that the first application caused no undue irritation. For intermediate cleansing, as after micturition or defaecation, perchloride or biniodide of mercury of a strength of 1 to 1000 should be used. In order to avoid irritation from the iodine it is important that this solution should not be applied to any moist skin surfaces such as the folds of the groin or the buttocks—nor should the patient's bed linen be soiled with it.

No attempt should be made to sterilise the vagina itself or the cervix uteri.

Sterilisation of Water and Instruments; Choice of Soap.

The water used for the obstetric toilet, if not boiled and placed in a sterilised bowl, should, for safety, be chemically sterilised. The antiseptic chosen for this purpose should be one which does not decompose soap, and does not interfere with the action of the iodine subsequently applied to the vulva. Because they do not comply with these requirements perchloride of mercury, permanganate, the carbolic and cresol compounds, and the chlorine compounds, have each their disadvantages. The most suitable agent would seem to

be a 1 in 8,000 solution of iodine (1 drachm of 2 per cent. iodine solution to a pint of water). This may be relied upon to kill haemolytic streptococci and *B. coli* within 2 minutes in the absence of gross contamination by organic matter, and it lathers well with soap. The water should be left for at least 2 minutes after the iodine is added to it before the soap is put in. Some form of antiseptic soap, such as coal tar soap, should be used for this purpose.

Instruments.

It has come to the notice of the Committee that it is a not uncommon practice when midwifery forceps are about to be used for them to be soaked, without recent boiling, in a bedroom jug filled with water, which has not been sterilised, and to which has been added "a dash of Lysol." They cannot too strongly condemn this careless practice. All instruments should be boiled shortly before use, and remain in the water in which they have been boiled, or taken out and wrapped in a sterile cloth until required. Every accoucheur should carry a steriliser large enough for boiling midwifery forceps as part of the equipment of his midwifery bag.

Treatment of the Hands.

This should be based upon frank recognition of the facts that (1) the skin of the hands cannot be sterilised in the bacteriological sense by any process which can be used day after day without damage to the skin; and (2) that there is danger of droplet infection from the mouth or nose of persons assisting at the labour. It is, therefore, considered that the use of gloves, sterilised and frequently re-sterilised on the hands, should become a routine practice.

The Committee, however, do not overlook the fact that a number of institutions conducting large hospital and district practices without this precaution can show an extremely low death rate from sepsis. A method frequently used is as follows:—The hands and forearms are scrubbed in warm water and soap for five minutes, rinsed in clean water, scrubbed and soaked in 1 to 1,000 aqueous solution of perchloride or biniodide of mercury for 2 minutes. The process is repeated whenever the hands may have been contaminated or whenever an internal examination is to be made. Probably where discipline is good, and where the full antiseptic method of these institutions is conscientiously carried out, this treatment of the hands leaves very little to be desired. Where these conditions do not obtain, the use of gloves will afford a greater margin of safety, and they should in any case be used where the patient has a purulent discharge, or where the skin of the hands of the attendant is "chapped," sore or rough.

The following alternative methods of preparation of hands and gloves are suggested:—

A. Dry Sterilisation.

Hands thoroughly washed with soap and water*; rinsed in clean water and soaked in perchloride or biniodide of mercury solution 1 in 1000;

* The use of running water, if available, gives more rapid and effectual cleansing.

dried with spirit or sterilised towel; gloves sterilised in steam steriliser; put on dry.

B. *Wet Sterilisation.*

Hands thoroughly washed with soap and water; rinsed in clean water; soaked in 1 in 1000 perchloride or biniodide of mercury solution; gloves wrapped in lint or gauze, boiled and put on wet out of the water in which they have been boiled.

C. *Chemical Sterilisation.*

The hands are thoroughly washed with soap and water and dried on a clean towel or with spirit. Dry clean gloves are put on with the aid of a little talcum powder. The gloved hands are now thoroughly washed with soap and water and rinsed in clean water. They are then soaked for two minutes in the 2% iodine solution, or, since this is apt to be destructive to the rubber, in 0.2% solution of mercury biniodide and potassium iodide in 50% spirit.

By whichever method gloves are originally prepared they can be effectually and repeatedly *re-sterilised on the hands* after contamination by again washing thoroughly with soap and water and soaking from time to time in one of the chemical solutions referred to above in order to guard against the imperceptible danger of droplet infection from the mouth or nose.* It should become an invariable routine to carry out this re-sterilisation of gloves whenever they are to be brought in contact with the patient's vulva.

Method A is the usual operating theatre method and is satisfactory, but pre-supposes the facilities of a well-equipped hospital, unless public health authorities should provide means of dry sterilisation of gloves without cost to the midwife. Method B gives equally efficient disinfection and can be readily carried out in domiciliary practice, but has the great practical disadvantage that the gloves, being put on wet, cannot be worn for any length of time without rendering the skin of the hands soft and macerated. Method C combines the advantages of a dry method with a simplicity which renders it suitable for domiciliary use, and it has been shown experimentally and by practical experience that gloves can be effectively sterilised and re-sterilised in this way. A drawback to this method to which several members of the Committee, however, attach considerable importance is the non-sterilisation of the inside of the glove. It is important that gloves should be thoroughly cleansed, boiled and dried after use, and should be carried in a small bag or special receptacle, so as to minimise the risk of carrying infection from case to case.

Emergencies arise in midwifery practice in which there is not time to prepare the hands by any methods described. The Committee believe that the *quickest* way to render the hands as sterile as possible under such circumstances is to wash them in soap and water and swab them with 2 per cent. iodine solution. It is obviously better to remove the placenta with hands thus imperfectly prepared

* Where iodine is used, there is much to be said for the practice of rubbing the gloves with squares of lint carried in a wide-mouthed jar of the antiseptic solution (4 to 5 inches in diameter with a close-fitting glass cover) instead of soaking them in solution poured into a bowl. Not only is a great economy effected thereby, but the action of the antiseptic is assisted by friction in removing any dried infective material.

than to allow a woman to die of post-partum haemorrhage, although in all cases where time permits sterile gloves should, of course, be worn.

As a lubricant for the hands, whether gloved or ungloved, 1 per cent. iodine and potassium iodide in 75 per cent. glycerine should be employed and not ordinary vaseline.

The Committee desire further to place on record an expression of their view that *Lysol* as used is insufficiently safe and reliable to be generally commended as an antiseptic in midwifery, either for the hands or for the patient's skin, on the grounds (a) that there are solutions of *Lysol* in use which are not uniform in germicidal strength; (b) that even when this discrepancy is met by standardisation a solution of *Lysol* of adequate germicidal strength has been found to be too irritating to the skin for routine use, especially if effective re-sterilisation by *Lysol* is attempted; and (c) that the distinctive smell gives a false sense of security to midwives in the use of solutions too weak to be of the slightest use as killers of microbes.

DIETETIC MEASURES FOR THE PREVENTION OF SEPSIS.

The prophylactic administration of Radiostoleum (Vitamin A and D) during the last month of pregnancy to a group of 275 women, and careful comparison of their lying-in periods with those of a similar group of untreated women, has been reported by Green, Pindar, Davis, and E. Mellanby*. The results were favourable to the hypothesis that an adequate supply of vitamin A and D during pregnancy was conducive to an afebrile puerperium, but it is hardly possible to regard this hypothesis as definitely established by such a limited investigation. The fortuitous introduction of disturbing factors might have contributed to the result.

Other evidence of the importance of vitamin A—apparently less open to question—is, however, provided by the work of Boynton and Bradford reported in the *Journal of Nutrition* (1931, 4, 323). Previous work by several authors had shown that young animals deprived of vitamin A ceased after a time to put on weight, and ultimately died in very bad condition with evidence of infection of one or more mucous membranes. It seemed rather doubtful whether the susceptibility of these animals to infection justified the assumption that *minor degrees* of vitamin A deficiency (such as might occur in expectant mothers owing to the demand of the developing foetus) would likewise result in a significant lowering of the normal resistance to infection. Boynton and Bradford investigated this latter point and have produced evidence that rats show a definitely increased susceptibility to experimental infection, even in the early days of a vitamin A deficiency—before they begin to lose weight. So far as it goes, this work and the Ante-natal test at Sheffield,† provisionally support the view that an ample supply of vitamin A should be assured to the pregnant woman.

* Ref. B.M.J., 1931, ii, 595.

† Ref. Vitamin A as an anti-infective agent. E. Mellanby and H. N. Green, B.M.J., June, 1929.

The Committee consider that it is desirable, in view of its importance, that the Sheffield investigation should be repeated on a larger scale, if possible with bacteriological examination of the febrile cases. Pending further light on the matter, expectant mothers should be advised to ensure an adequate supply of milk, eggs, green vegetables, carrots and butter. For any who are unlikely to get these sources of vitamin A, cod liver oil might well be provided whenever possible.

Summary of Research Work.

During the last few years there has been a considerable growth of investigations bearing upon the problem of maternal mortality, which have received the consideration of the Sub-Committee on Research, and to which various references will be found in the Report.

The following summary indicates the distribution and the scope of the inquiries still in progress, or contemplated, so far as they have come to the notice of the Committee. Many of the investigations cited have been or are being assisted by grants from the Medical Research Council. Those at Queen Charlotte's Hospital are also receiving invaluable aid from the generosity of the Rockefeller Foundation to the furthering of the Hospital's research work.

The magnitude and complexity of the problems concerning puerperal sepsis have led to a concentration of effort on this subject in different parts of the country. The investigations may be grouped under the headings of Etiology, Pathology, Prevention and Treatment, and the various centres at which the work is being carried out are shown below :—

Aberdeen (The City Laboratory. Dr. J. Smith).

Edinburgh (The Elsie Inglis Memorial Hospital. Dr. Nesbit and Colleagues).

Glasgow (The Royal Maternity Hospital. Dr. D. Baird).

London (Queen Charlotte's Hospital. Drs. Leonard Colebrook, Fry, Hare, Fuller, and Elizabeth Cooper).

(University College Hospital. Dr. Gladys Dodds).

(Ministry of Health. Dr. F. Griffith, Dr. Dora Colebrook.)

(London County Council Serum Laboratories, Dr. E. W. Todd; and Puerperal Fever Section, Drs. Joe, Wyatt, and Inkster).

Manchester (The University Department of Bacteriology and Preventive Medicine. Dr. Phyllis Congdon).

Sheffield (The Jessop Hospital Puerperal Fever Extension. Dr. C. G. Paine).

(Department of Pharmacology. Professor E. Mellanby and Dr. H. N. Green)

A. *Etiology of Puerperal Fever.*—Investigations are in progress :—

- (1) On the identification of strains of streptococci isolated from puerperal fever cases with strains isolated from the throat or nose of individuals in contact with them prior to the onset of fever. (Aberdeen. Sheffield. Queen Charlotte's Hospital. Ministry of Health Laboratory.)
- (2) On the epidemiology of outbreaks of puerperal fever; their relation to particular types of streptococci; and the relative

importance of "contagion" from infected cases and of the throat carrier. (Ministry of Health Laboratory. Queen Charlotte's Hospital.)

- (3) On the incidence of pyrexia among women carrying haemolytic streptococci in the genital tract (or throat) at the onset of labour; and on the virulence of such streptococci (animal test). (Edinburgh.)
- (4) On the relative frequency of infection by haemolytic streptococci following normal labour among women delivered at home and in maternity institutions. (Edinburgh. Queen Charlotte's Hospital.)
- (5) On the presence or absence of haemolytic streptococci at the onset of labour (in the genital tract or throat) of women who subsequently develop infection by these streptococci. (Edinburgh. Queen Charlotte's Hospital.)
- (6) On the incidence of infection by anaerobic streptococci; on the source of these infecting cocci and on their differentiation. (Queen Charlotte's Hospital.)

B. *Pathology of Puerperal Fever*.—Investigations are being made:—

- (1) On the natural response to infection by haemolytic and anaerobic streptococci respectively. (Part relating to anaerobic streptococci not yet commenced.) (Sheffield. Queen Charlotte's Hospital.)
- (2) On an antigenic haemolysin produced by haemolytic streptococci; and its possible relation to the progress and the symptoms of puerperal infections. (Queen Charlotte's Hospital. London County Council.)
- (3) On the sensitiveness (skin test) of patients infected by haemolytic streptococci to the endotoxins and exotoxins of these cocci. (Ministry of Health Laboratory. Queen Charlotte's Hospital.)
- (4) On the production of toxins in the exudates of peritonitis patients. (Queen Charlotte's Hospital.)
- (5) On toxin production by anaerobic streptococci. (Q.C.H.)
- (6) On the mode of origin and spread of septic clots in veins (not yet commenced). (Q.C.H.)
- (7) On the development of ileus in association with general peritonitis. (Q.C.H.)
- (8) On the properties of lochial fluid that may check infection or affect its results (not yet commenced). (Q.C.H.)
- (9) On the metabolic disturbances associated with the more severe forms of puerperal infection (general peritonitis and septicaemia). (Q.C.H.)
- (10) On the bacillus coli infections of the urinary tract during pregnancy and the puerperium. (Glasgow. University College Hospital.)

C. *Prevention of Puerperal Infections*.—This field comprises experiments:—

- (1) On the possibility of active immunisation against haemolytic streptococci, anaerobic streptococci and *B. coli* during pregnancy. (Queen Charlotte's Hospital.)
- (2) On the importance of an adequate supply of Vitamin A in the diet of pregnant women. (Sheffield.)
- (3) On the choice of antiseptic for the sterilisation of the hands and of the vulva, etc.; on the possibility of sterilising the vagina by means of antiseptic substance; and on the use of antiseptics in utero after obstetric interference. (Queen Charlotte's Hospital.)
- (4) On the possibility of distinguishing between the dangerous and the harmless throat carrier of haemolytic streptococci (not yet started).

D. *Treatment of Puerperal Fever*.—This includes investigations:—

- (1) On the chemotherapy of infection by haemolytic streptococci (by organic arsenicals and other agents).

Objectives: (a) The checking of localised infections in the early stages.

(b) The sterilisation of the blood stream in cases of generalised (septicaemic) infection. (Sheffield. Queen Charlotte's Hospital.)

- (2) On the chemotherapy of infections by anaerobic streptococci (not yet commenced).
- (3) On ligation of veins for thrombophlebitis; procedure for early diagnosis of this condition; operative technique. (Q.C.H.)
- (4) On early drainage—and associated physiological measures for treatment of general peritonitis. (Q.C.H.)
- (5) On the possible curative value of a new type of therapeutic serum (anti-haemolysin). (London County Council and Q.C.H.)
- (6) On new urinary antiseptics. (Q.C.H.)

Many other fields of research, some involving combined clinical observation and laboratory work, remain to be explored. The Committee desire particularly to call attention to the problems associated with the causation and treatment of obstetric shock, the recurrent toxæmias of pregnancy (work on which is being done at University College Hospital, at the Jessop Hospital, Sheffield, and at the Royal Maternity and Simpson Memorial Hospital, Edinburgh), the geographical distribution of contracted pelvis and of toxæmia, and the causation of uterine inertia.

Soon after their appointment, the Committee took steps towards initiating a clinical inquiry to try to ascertain more exactly the value of intra-uterine injections of glycerine in the treatment of puerperal sepsis in varying types of case, and in particular the cases giving a blood culture of haemolytic streptococci. In spite, however, of the helpful co-operation of the medical staff of several hospitals, for which the Committee desire to express their thanks, the inquiry proved abortive, as the information obtained was not adequate in volume or in detail to enable the Committee to set forth any generalised conclusions.

CHAPTER VIII.

MATERNAL MORBIDITY.

While the Committee have been chiefly concerned with the problems of mortality associated with pregnancy and childbirth, they have not lost sight of the fact that their terms of reference include also the disablement too often attendant thereon. Not infrequently the mother, though she survives delivery, is left with disease or disability that has been caused or aggravated by pregnancy, or that is the result of injury or infection during labour. Her health and vitality are in consequence impaired, her usefulness diminished, and her expectation of life shortened.

At the same time they recognise that the prevalence of this morbidity is difficult to assess. No accurate statistics regarding it are yet in existence; it seems that they might be impossible to obtain with any approach to accuracy. The reasons for this are various. If there are definite lesions accounting for symptoms, the existence of organic disease is placed beyond doubt, and its frequency might be assessed by properly concerted efforts. But too often the evidence of disease or of departure from the normal are subjective only; the patient's complaint, while to her very real, cannot be related to any particular organ. In estimating the degree of disability in such patients, the investigator, if he is to form conclusions that are approximately correct, must take into account the personality of the patient, her capacity to bear pain and her accessibility to suggestion.

If it were possible to obtain details of the results from a large number of post-natal clinics throughout the country, in which patients had been followed up for some years, a more exact estimate of the amount of maternal disablement might be made, but the number of post-natal clinics is so small and their establishment so recent, that this source of information is negligible.

The Committee have examined such evidence as is available on this subject so far as to enable them to form an estimate, necessarily only approximate, as to the prevalence of maternal disability and the form in which it chiefly exists. That this is frequent there can be no doubt.

Professor Blair Bell* found that at the Royal Infirmary, Liverpool, during the six years 1925-31, 47·3 per cent. of all gynaecological operations were concerned with the relief of local injuries and infection, and of 2,275 consecutive parous women seen in the gynaecological out-patients' department, 775 (34 per cent.) were suffering from disablement due to pregnancy and parturition. Of these 627 (80·9 per cent.) had traumatic or infected lesions, including such conditions as pelvic peritonitis and cellulitis, salpingitis, cervicitis, etc. Among the remaining 148 there were 112 cases of cancer of the cervix. As Blair Bell points out, these represent only the more serious conditions for which women seek advice.

* Lancet, May 30th, 1931, 1171.

At the Royal Samaritan Hospital for Women,* Glasgow, in the years 1928, 1929 and 1930, 7,734 patients were treated, and it is recorded that in 2,178 (28·1 per cent.) of these, infection associated with childbirth was an etiological factor in the condition for which they were treated, and injury associated with childbirth in 2,730 (35·3 per cent.).

Miller,† in a follow-up of 2,000 women in the Edinburgh Post-Natal Clinic, found that in 30 per cent. the condition was unsatisfactory, i.e., the patients suffered from disability of various kinds such as leucorrhoea, back-ache, subinvolution, prolapse, retroversion and various lesions of an infective nature, such as cervicitis.

If we assume such results to be typical of those obtained in other centres, we are compelled to conclude that a very large number of women yearly suffer, in greater or less degree, from disabilities following and resulting from childbearing.

In view of the importance of the subject, the Committee desire to make certain observations on some of the clinical conditions referred to.

I. The Effect of Abnormalities of Pregnancy and Childbirth upon the Health of the Mother.

Toxaemias of Pregnancy.

Although the subsequent fate of the patient who has suffered from eclampsia or albuminuria of pregnancy and survives the immediate dangers is of much importance to the practitioner, whose responsibility for the welfare of his patient does not end with the termination of pregnancy, there have been until the last few years but few investigations throwing any light upon it. Evidence has, however, been gradually accumulating which proves conclusively that eclampsia is by no means the only danger that confronts the patient who is the subject of albuminuria of pregnancy. A considerable proportion of patients become the subject of chronic nephritis, with consequent impairment of health and diminished expectation of life.

The Committee believe that the frequency and importance of this train of events is as yet insufficiently appreciated by medical practitioners in general. Eclampsia is all too frequently regarded as the sole risk to be guarded against in the patient who is the subject of toxæmia of pregnancy. True, it is the more immediate and dramatic risk to which such patients are liable. But that there are others more insidious and remote, but by reason of their frequency not less important, must be admitted by everyone who studies the evidence with an unbiassed mind. It is generally admitted that about 4 per cent. of all pregnant women suffer from albuminuric toxæmia of all grades of severity, an incidence of 28,000 yearly. If we assume as a moderate estimate that 35 per cent. of these ultimately become the victims of chronic renal disease or recurrent albuminuria, it means that every year at least 10,000 puerperal women are more or less seriously damaged from this cause alone. No further words are

* Annual Reports of the Royal Samaritan Hospital, Glasgow.

† Miller, Douglas. B.M.J., April 20th, 1929, 717.

necessary to emphasise the seriousness of such a state of matters. Further research into the various aspects of this problem, including etiology, geographical distribution, prevention, and treatment, is one of the most urgent problems of preventive medicine.

Preventive Measures.—No fact in connection with the prevention of maternal mortality has become better established within recent years than that, although its etiology remains obscure, eclampsia is almost entirely a preventable disease. This is clearly demonstrated by numerous statistics from large and well-conducted ante-natal clinics. Thus, in the East End Maternity Hospital there was one case of eclampsia among 10,376 women supervised.* In Guy's Hospital there were only four in 6,140 in three consecutive years.† Yet the incidence of deaths from eclampsia over England and Wales as a whole is still about 1 in 1,300 births. This can only be explained by assuming either that but a small proportion of pregnant women yet submit themselves to ante-natal care, or that the ante-natal supervision and treatment they receive is inadequate. One possibility, however, cannot be overlooked, viz., that the incidence of eclampsia is lower in London and the South of England than in the Midlands and the North. The Committee refer in Chapter VII. to the need for research on this point.

The Committee feel it necessary to emphasise that if the heavy annual toll of life and health incident to the toxæmias of pregnancy is to be diminished, more attention must be given to early diagnosis and adequate treatment. For early diagnosis regular examination of the urine for albumin is important. This should be carried out at least once monthly till the thirtieth week, every fortnight till the thirty-sixth week, and weekly thereafter till delivery. Even more important than examination of urine is estimation of the blood pressure at the same frequent intervals, for there is evidence that a rise of blood pressure may precede by some days, or even weeks, the appearance of albumin in the urine, and it is well known that even eclampsia may occur in the absence of any preceding albuminuria and when the only warning sign was the presence of a raised blood pressure and perhaps oedema. Both systolic and diastolic estimation of blood pressure are essential, and a pressure exceeding 140 systolic and 90 diastolic should be regarded as abnormal, no matter what the age of the patient, and whether other signs of toxæmia, such as oedema and albuminuria, are present or not.

For such patients immediate treatment in hospital or its equivalent should be provided. Above all, rest in bed is essential. As dangerous developments may ensue with alarming rapidity, almost constant supervision should be maintained. As the behaviour of the blood pressure is the best available index of progress, it should be recorded once or twice daily and the quantity of urine carefully measured. The available methods of treatment are well known and need not be repeated here, but it may be emphasised that, should the signs and symptoms not clear up, the question of induction of prema-

* Proc. Roy. Soc. Med., Sect. Obs. and Gyn., Dec., 1930, vol. xxiv.

† Reports of Guy's Hospital Maternity Department.

ture labour should be considered, not only with the object of preventing eclampsia, but also in order to minimise the risk of the supervention of chronic renal disease. Fortunately, at the period of pregnancy when pre-eclamptic toxæmia occurs, the foetus usually has already reached the period of viability, and interruption of pregnancy, therefore, does not often mean sacrifice of the life of the child. Even if it has not reached the viable period, the position as to the future health of the mother is so uncertain that it is advisable to ignore the chances of survival of the child and to terminate the pregnancy if the signs of toxæmia, albuminuria, hypertension, etc., do not clear up after at most two or three weeks' treatment. Besides, it should be remembered that premature interruption of pregnancy is not only best for the mother in that it reduces the risk of chronic renal disease, but it may be also a measure of safety for the child, as foetal death in utero not infrequently occurs in pre-eclamptic toxæmia.

Pyelitis.

Evidence is accumulating that a considerable percentage of the patients who have suffered from pyelitis in pregnancy afterwards become the subjects of chronic pyelitis with or without hydro-ureter and hydro-nephrosis or bacteriuria. The most recent figures are those published by Gladys H. Dodds* from University College Hospital. In a follow up of 48 patients, all of whom had suffered from pyelitis during pregnancy, it was found that 23 (47·9 per cent.) were completely cured (urine sterile on culture); 14 (29 per cent.) developed chronic pyelitis, and 11 (23 per cent.) had persistent bacteriuria only. Of 31 cases of puerperal pyelitis (in which the pyelitis was discovered for the first time post-partum) 19 (61·2 per cent.) got quite well (urine sterile on culture); 3 (10 per cent.) were found to have chronic pyelitis, and 9 (29 per cent.) had bacteriuria only. Of the 14 patients with chronic pyelitis 2 had hydro-ureter and hydro-nephrosis.

It is of great importance that patients suffering from pyelitis should be admitted to hospital for investigation and treatment, as the dangers of the condition are not always realised.

Local sequelae of Puerperal Sepsis.

It is well recognised that much chronic ill-health and disability follow local septic infections such as parametritis, pelvic peritonitis, and phlegmasia alba dolens, and for the detection and treatment of such after-effects post-natal examination is essential. There can be no doubt that *lacerations and infections of the cervix* following delivery are frequently the source of minor degrees of discomfort and disability. Goff† states that about 40 per cent. of primiparae have significant injuries to the cervix after labour. Cervicitis is well recognised as a cause of leucorrhoea, back-ache and abdominal pain, while it is probable that it may act as an infective focus from

* Ref. Journ. Obst. and Gyn., Brit. Empire, 1932, xxxix., 46.

† Ref. Goff. Am. Jl. O. and G., 1928, 15, 440.

which may originate such conditions as rheumatism and rheumatoid arthritis. Moreover, it is generally agreed that cervicitis and cervical laceration are important pre-disposing causes of cancer of the cervix. Thus, about 4,000 women die annually of cancer of the cervix in England and Wales alone, and about 95 per cent. of these cases occur in women who have borne children. More attention should be paid to the state of the cervix in the post-natal period, when routine examination should include exposure of the cervix and its examination by the speculum. If cervicitis is found, treatment might well be undertaken in slight cases in the out-patient department; in more severe cases, and especially if there is much laceration, in hospital, where plastic repair of the cervix may be the best treatment.

Retroversion.

This condition is a not uncommon sequel of parturition, and though it is doubtful whether it often gives rise to any serious disability when unassociated with other pelvic abnormalities, such as infections or prolapse, there can be no doubt that it not infrequently gives rise to backache and general pelvic discomfort. Miller found it in 18 per cent. of 2,000 cases seen five weeks after delivery at the post-natal clinic at the Edinburgh Royal Maternity Hospital,* and F. W. Lynch† investigated 1,230 women between four and twelve months after delivery and found retroversion in 41.1 per cent. If retroversion is discovered early it is curable by simple pessary and postural treatment, and Lynch notes that 70 per cent. of his patients were cured by the use of a pessary for from two to six months. In the prevention of retroversion, in addition to measures directed to promote involution, including suitable exercises in bed, many authors emphasise the importance of letting the patient sit up early in the puerperium, and even from the third day making her lie for a certain time daily in the prone position. It is important also to prevent distention of the bladder, which is particularly likely to occur during the lying-in period. Retroversion is often undiscovered in the absence of a careful post-natal examination.

Reproductive Insanity.

Robert Jones‡ estimates that one case of insanity arising in connection with pregnancy, delivery or lactation is admitted into an asylum for every 1,100 births. Of all forms of insanity those associated with reproduction are the most prone to recover completely, especially if the disorder has been acute in its onset and has set in shortly after delivery, but Jones states that he has known many such cases end in chronic dementia, and Whitridge Williams§ says that 20 to 40 per cent. of those following infections fail to regain their normal equilibrium. If the onset has been gradual and the form of

* Ref. Miller, Douglas. B.M.J., Ap. 20th, 1929, 717.

† Ref. Lynch, F.W. Am. J. Obst. and Gyn., vol. iv., 1922, 362.

‡ Ref. Jones, Robert. Jnl. Obst. and Gyn., Brit. Emp. 1903, 3, 109.

§ Ref. Williams, J. Whitridge. Obstetrics, 6th Ed., Appleton, 1120.

insanity is melancholia the condition is extremely likely to become chronic. According to Saunders* only about half these cases recover permanently.

II. The Effect of Child-bearing upon Pre-existing Disease.

Tuberculosis.

It is no longer possible to hold the old idea that the tuberculous woman is ever beneficially affected by pregnancy. According to Rist,† recent statistics based on reliable diagnostic criteria show that almost invariably there is an aggravation of symptoms from flaring up and extension of the existing lesions and the appearance of fresh ones. Rist followed up 52 cases who had tuberculosis when they became pregnant, with the following results:—The condition was unchanged in 15·3 per cent., and changed for the worse in 84·6 per cent. Death occurred after one year in 19 cases, and after two years in 26 cases. The symptoms and signs of an aggravation of a tuberculous lesion may appear at any time during the course of pregnancy, and a considerable number of cases become suddenly worse after confinement. The frequency of laryngeal involvement in tuberculous and pregnant women has been noted by most writers. It may have to do with the fact that during normal pregnancy congestion of the larynx occurs, affecting especially the false vocal cords.

As there is thus fairly strong evidence regarding the deleterious influence of pregnancy on the tubercular lesion it might be expected that there is a clear case for the artificial termination of pregnancy as soon as possible after its commencement. The problem is, however, by no means so simple. Pregnancy cannot, as a rule, be interrupted without more or less shock and loss of blood, and these are notoriously injurious to the tuberculous patient. It may be said in the first place that if abortion is ever to be induced it should be limited to the first three months, because clinical experience shows that after that period induction leads to an aggravation of the lung symptoms. As to the question whether abortion should be induced at all, the opinion of Rist is worth quoting. He says: "I do not think it has been sufficiently proved at the present time (1927) that abortion is really efficient in arresting the course of tuberculosis of the lungs, determined or aggravated by pregnancy. Some very satisfactory results have been published, but they are few in number. For my part I have seen spontaneous abortion influence tuberculosis just as unfavourably as confinement." It may, therefore, be said that while the question is not yet finally decided, the weight of expert opinion is against therapeutic abortion in tuberculosis. In any case the abortion should only be undertaken after the fullest consideration, and after consultation with an expert. Should it be decided to allow the pregnancy to continue, the tuberculous condition should be managed on the usual lines, including the possible induction of artificial pneumo-thorax to which pregnancy is not necessarily a

* Ref. Saunders. Am. Jl. Psychiat., 1929, 8, 669.

† Ref. Rist, E. B.M.Jl., August 13th, 1927, 247.

contra-indication. Another pregnancy should be avoided until the patient has been clinically well, with a normal temperature and absence of tubercle bacilli from the sputum, for at least two years.

The Committee desire to draw attention to the difficulty which not infrequently arises in obtaining suitable accommodation for tuberculous women both during pregnancy and for delivery. The allocation of a few special beds in voluntary or municipal hospitals would be of undoubted value. The Committee is informed that at one sanatorium, conducted by a voluntary committee, a proposal is under consideration to provide a small number of beds to be reserved for pregnant and parturient women.

Heart Disease in Pregnancy.

It is well known that all forms of organic heart disease tend to be adversely affected by pregnancy, so that the patient's expectation of life is to a greater or less extent diminished. Numerous statistics could be quoted to prove the high immediate mortality attending this condition in pregnancy and labour, but in this section we are concerned only with the aggravation of disablement in those who survive. Even after pregnancy and labour are safely passed, it is frequently found that a certain amount of permanent heart weakness is left, which is shown by diminished exercise-tolerance as compared with that present before pregnancy. Of six cases of auricular fibrillation during pregnancy observed by Mackenzie,* all with mitral stenosis following rheumatic fever, though all survived the confinement, none ever recovered the same degree of health as was present before pregnancy, and five gradually became worse after delivery and died within two years. Crighton Bramwell† and Mary Regan, in a study of 82 cases of heart disease of all grades of severity at St. Mary's Hospital, Manchester, found that out of 66 who survived labour, and were followed up afterwards, in at least three the condition was aggravated by pregnancy. Three thousand women attending the ante-natal clinic during 18 months were examined for heart disease, and amongst them were found 79 cases of organic heart disease. If we assume that the women attending the ante-natal clinic at this hospital represent a fair sample of the population of the country as a whole, the incidence of heart disease in pregnant women in England and Wales is about 4 per cent.—that is, 28,000 cases yearly. Assuming that 4 per cent. of these are aggravated by pregnancy, we arrive at the conclusion that 1,120 cases yearly represent the disablement resulting in cardiac cases from childbearing. Such figures, coupled with the high immediate mortality, emphasise the risk of pregnancy in these patients. It is not the purpose of the Committee to enter into details of management, which are given sufficiently well in text-books of obstetrics, but they consider it necessary to emphasise that careful supervision is needed in the ante-natal period and during labour, and the amount of

* Ref. Sir James Mackenzie. *Heart Disease in Pregnancy*. Oxford Med. Pub., 1921.

† Crighton Bramwell. *Lancet*, 1931, Jany. 31.

physical strain regulated, so that it is well within the patient's capacity. Should congestive failure set in, it is important that whenever possible the patient should be transferred to hospital, so that she may be free from household worries, may have the benefit of skilled nursing and be under the immediate supervision of a cardiologist who can collaborate in treatment with the obstetrician. No hard-and-fast rules can be laid down regarding treatment. Each case is a problem in itself and requires special study, but the Committee would emphasise the absolute need for close co-operation between the physician and the obstetrician if the best results are to be obtained. The management of labour may call for the exercise of all the obstetrician's powers of judgment, and the claims of Caesarean section, with or without sterilisation, should receive full consideration.

Diabetes.

Before the proper dietetic management of diabetes was understood the effect of pregnancy on the disease was almost always disastrous. Since the introduction of insulin the outlook for mother and child has been transformed. Arnold Walker* has collected 18 insulin-treated cases from literature and reports one of his own. In 13 of them the diabetes was known to exist before pregnancy, in three it was first discovered during pregnancy, and in the three others the information was not available. In only one case did a patient die in or immediately after labour. In addition to diabetes she had severe toxæmia of pregnancy and probably eclampsia. One other died from broncho-pneumonia some weeks after delivery. There was no case of death from diabetic coma. Walker, from this review, concludes (1) that insulin has entirely altered the outlook on diabetes in pregnancy; (2) there now seems to be no reason to terminate pregnancy, and no reason why a diabetic should not give birth to a living child; (3) there is no special incidence of puerperal infection; and (4) neither does pregnancy seem to have any ill effect on the diabetic condition. There is as much need as in pre-insulin days for general care, especially rest, freedom from worry, avoidance of chills and exposure to infection. From the beginning of pregnancy the patient should be under the care of a physician who will co-operate with the obstetrician.

Chronic Nephritis.

The available evidence proves conclusively that the occurrence of pregnancy in a patient who is already the subject of chronic nephritis is a most serious event for the mother, the nephritis being invariably aggravated and the expectation of life shortened. The most recent and striking figures published are those of H. J. Stander and C. H. Peckham from Johns Hopkins Hospital.† These workers traced 135 of 263 patients admitted with 260 pregnancies between the 1st January, 1919, and 31st December, 1928. Of these 260 preg-

* Ref. Walker, A. Proc. Soc. Med., vol. xxi., part 1, 1927-28, 378.

† Amer. Jnl. Obst. and Gyn., 1931, 626.

nancies, 63·46 per cent. had been allowed to go to term, 19·23 per cent. ended prematurely, but after viability of the child, and the remaining 17·31 per cent. were abortions. Of the 135 patients followed up 46 (42·5 per cent.) were dead, 37 of the deaths being due to nephritis. Of the 89 who were still alive 30 had severe nephritis and 20 moderate, but definite, kidney damage. In 13 there was no information except that they were still alive, and in 26 (19·27 per cent.) there was no demonstrable sign of kidney disease at the time of examination. The Committee consider the evidence shows clearly that in all cases where there are unmistakable signs of chronic nephritis, pregnancy should be avoided, while if it occurs it should be terminated as early as possible.

Chorea Gravidarum.

Chorea gravidarum in a large majority of cases runs a mild course, and does not materially affect the course of pregnancy. It may clear up before the onset of labour as occurred in 15 per cent. of Buist's cases,* but more often it continues until after delivery, when it usually improves rapidly, so that at the end of the third week of the puerperium movements can no longer be detected. Sometimes, however, the movements take several months before they completely disappear as in a case of McCann's† when they lasted for 5 months after delivery, and one of Buist's in which they persisted for 3 years. On the whole the disease tends to be of a more severe type than chorea occurring apart from pregnancy, and insanity is more likely to develop.

Epilepsy.

Pregnancy may occasionally be the starting point of epilepsy, especially in those who have a family predisposition to it. In those in whom the disease is already established the effect of pregnancy is very variable. Sometimes there seems to be no influence whatever, but in a large proportion the fits are increased in frequency and severity. This was the case in 36 per cent. of 92 women whom Nerlinger‡ observed in 157 pregnancies. Pregnancy, too, may cause relapse of an epilepsy which has been for some years apparently cured.

Conclusion.

From this brief survey it will be clearly realised that morbid conditions following on pregnancy and childbirth or aggravated by them form a group of great importance, and that the problem of prevention, of provision of skilled observation and diagnosis, and of facilities for hospital treatment is a pressing one.

The Committee desire in this connection to call special attention to the importance of the avoidance of pregnancy by women suffering from organic disease such as tuberculosis, heart disease, diabetes,

* Buist, R. C. Trans. Edin. Obst. Soc., 1894-5.

† McCann, F. J. Trans. Lond. Obst. Soc., 1891, 33, 413.

‡ Nerlinger Inaug. Dissert. Heidelberg, 1889.

chronic nephritis, etc., in which child-bearing is likely seriously to endanger life. They consider that advice and instruction in contraceptive methods should be readily available for such women, and their husbands, from private practitioners, at hospitals or at gynaecological clinics set up by local authorities under the Public Health Acts in accordance with suggestions made by the Ministry of Health in Circular 1208 (1931).

It should, however, be recognised that there are no entirely reliable appliances for the prevention of pregnancy, and that it is often impracticable for women in working-class homes to use approved methods in a satisfactory and effective way. Therefore, when the avoidance of pregnancy is essential on medical grounds, the question of sterilisation should be considered.

The Industrial Employment of Women in Relation to Maternal Mortality and Morbidity.

Three allied problems are involved in a consideration of this question, first, the effect of work in factories and workshops upon the development and child-bearing capacity of girls and women, secondly, the effect of such work during pregnancy and the puerperium, and, thirdly, its effect upon the infant and so upon the future mothers of the race.

With regard to the first the Committee believe that owing to the beneficent provisions of the Factory Acts and to the enlightened outlook of the modern employer of labour towards the welfare of his employees, the evidence points to the conclusion that there is little, if any, detrimental effect upon the factory worker by such work as she is called upon to perform.

They are confirmed in this belief by considering the comparative ease of childbirth among the workers as opposed to the leisured classes.

As to the effect of work during pregnancy and the puerperium, there does not appear to the Committee to be any valid reason why a pregnant woman should not perform work of some kind up to the last week or two of pregnancy, but it should be of a suitable nature. It would be a hardship if cessation of factory work were to be made compulsory, as it would often entail a loss of wages and possible diminution in good food and exercise, both of which she needs. Moreover, industrial work is often lighter and less fatiguing than the household duties which would fall to her lot if she were to stay at home. The work should not, however, involve heavy lifting or prolonged periods of standing, and during the latter part of pregnancy the woman should be allowed frequent intervals of rest when she feels she needs them. Again the difficulty of getting to and from work in large towns in "rush hours" must be considered. It would appear, therefore, that it is not often feasible to provide the necessary conditions in a factory, and, as a matter of fact, most women find that they have to leave such work at or about the end of the seventh month of gestation, although there are other occupations in which

the necessary facilities can be made available. The Committee have arrived at the conclusion that the question as to whether work is likely to be detrimental to a normal pregnant woman depends upon its character, and that each case must be decided after careful consideration of all the factors concerned. Ordinary factory work is usually inadvisable during the last six or eight weeks of pregnancy.

The pregnant woman is subject to many minor discomforts and disabilities, which would not perhaps be sufficiently pathological to interfere with the capacity for work in a non-pregnant woman, but which assume more serious import under the added strain of pregnancy, and may render work inadvisable, if not definitely detrimental. Morning sickness, slight degrees of anaemia, varicose veins, breathlessness, and discomfort merely on account of increased bulk are instances to which we refer. There are, in addition, many pathological conditions associated with, or due to, pregnancy, such as toxæmia and cardiac strain, which, even in their slighter manifestations, constitute an absolute bar to employment of any nature.

In the opinion of the Committee the after-health of the normal mother depends much more upon the care she receives at and during the few weeks following her confinement than on abstinence from work before delivery. Many causes of disablement following parturition remain undiscovered, reducing the standard of health, possibly temporarily, or perhaps giving rise to serious disease or permanent disability later on in life. Common instances are the persistence of albuminuria in women who have suffered from toxæmia of pregnancy, subinvolution and displacement of the uterus, and strains of muscles and joints. The Committee, therefore, consider that careful examination should invariably be carried out before a woman returns to work, and that the most suitable time for this examination is at the end of the six weeks following confinement.

Consideration must also be given to the effect of maternal work upon the child. Lactation is a function which should be properly carried out in the immediate interests of the child, and also has a wider implication in that artificial feeding, if carried out on wrong lines, may be an important factor in the production of rickets. The investigations of the Committee emphasise the large part played by this disease in causing defective development or deformity of the bony pelvis and consequent obstetric difficulties, frequently terminating in maternal death. Lactation is inevitably interfered with by outside employment, and it may be taken as a general rule that it cannot be performed in conjunction with employment in a factory or workshop.

The Committee is of opinion that no pregnant woman should be compelled by lack of other resources to undertake industrial employment except in compliance with the conditions here laid down.

A word may be added as to *Sickness benefit in Pregnancy and the Puerperium*. In their Interim Report (p. 99) the Committee referred briefly to the bearing upon maternal health of the arrangements under the National Health Insurance Acts concerning sick-

ness benefit during pregnancy and the puerperium. They have now been able to give further consideration to the problems involved, and reference is made in Chapter VI. of this Report to the part, if any, which is played by the employment of women in the production of the high maternal mortality rate in certain areas in England and Wales.

From evidence given by Medical Officers attached to the Insurance Department of the Ministry of Health, and from other sources, they find that there is a certain degree of doubt as to how far women insured under those Acts are entitled to benefits during the physiological state of normal pregnancy, even in its advanced stages. This uncertainty has led to discrepancies in the way in which approved societies deal with claims for sickness benefit when pregnancy is certified as the cause of incapacity, some societies giving such benefits without question, and others referring all such claims to the Regional Medical Officer of the Ministry of Health for his decision. Although these officials without exception carefully decide each case on similar lines to those above described, there is a certain amount of hardship involved, as some women, rather than visit an official and undertake what may possibly be a fairly long journey to his office, prefer to forego benefits to which they may be entitled.

The Committee consider that it would be a great advantage if a uniform method of granting sickness benefit in pregnancy, which would be understood and acted upon by doctors and approved societies, were laid down. They, however, do not think that it is within their reference to enter into questions on the administration or legal interpretation of the National Health Insurance Acts, even if they were competent to do so, and have, therefore, confined themselves to a brief review of the purely medical aspects of the industrial employment of women in its relation to maternal mortality and morbidity.

CHAPTER IX.

CONCLUSIONS AND RECOMMENDATIONS.

It is now our duty to summarise the facts presented in this Report, and to submit such deductions as they seem to permit.

We have searched for, and scrutinised with care, the underlying cause of the deaths of 5,800 women in childbirth which have been reported to us. Particulars of the first 2,000 cases were presented in our Interim Report, and this Final Report is concerned with a further 3,800. The findings of the First Series are fully confirmed by the Second Series. We have found that the causes of death in these cases are of varied nature—clinical and social, administrative and economic—and are closely related one to the other. Thus, clinical errors are contributed to by economic conditions, and administrative measures are rendered nugatory by reason of ingrained social customs. A complete knowledge of all the circumstances in any case of maternal death is therefore necessary before apportioning blame to any individual or institution. We are, however, convinced that the primary essential for the reduction of a high maternal mortality is sound midwifery, before, during and after childbirth, and this does not chiefly depend upon administrative arrangements or the expenditure of public money.

Our inquiries have led us over a wide field, and in addition to consideration of the conditions obtaining in special areas of England and Wales, we have given attention to the midwifery services and the obstetric records of the Netherlands, Denmark and Sweden.

False hopes would be raised if it were suggested that all maternal deaths are preventable. Changes in social life necessary to raise the standard of health and physical development of the women of the nation can come only with time; great advances in medical knowledge must be made before many of the risks of childbirth can be eliminated; even then the factor of human fallibility will remain.

Nevertheless, we are confirmed in the opinion expressed in our Interim Report that at least half the deaths which have come under review could have been prevented had due forethought been exercised by the expectant mother and her attendant, a reasonable degree of skill been brought to bear upon the management of the case, and adequate facilities for treatment been provided and utilised. This conclusion is borne out by the fact that in the practice of a number of institutions (reference to which was made in the Interim Report) a death rate of less than half the national average has been recorded for a series of years. We have kept constantly before us the practical bearing of our problem, and in the preceding pages have sought to lay bare and define the reasons why such a standard of maternal care is not generally attained, and to suggest remedies which, in our opinion, may be made effective without undue delay.

Our Conclusions and Recommendations fall into two groups—clinical and administrative—and are briefly stated below.

A. Summary of Conclusions.

I. CLINICAL.

IMPERFECTIONS IN MANAGEMENT OF PREGNANCY AND LABOUR.

1. *Sepsis (Puerperal Infection).*

This accounts for thirty-seven per cent. of all these deaths, and is also the chief cause of morbidity after childbearing.

Sepsis following normal labour is responsible for eighteen per cent. of all deaths directly due to childbearing, and the majority are cases of sporadic infection which are as often contracted in the patient's home as in hospitals. The great majority of these deaths are preventable, and are being prevented in some centres of maternity work and in some private practices, thereby giving evidence that a conscientious technique in midwifery is efficacious in preventing infection with the streptococcus pyogenes. As shown by the Committee's investigations, failure to prevent these deaths occurs in many cases because (i) the antiseptic toilet is not carried out, or only in a perfunctory manner, (ii) insufficient recognition is given to the danger of infection from the throats of attendants and other persons in contact with the patient, and (iii) febrile cases are not sent to hospital sufficiently early.

Sepsis following difficult labour accounts for nineteen per cent. of all deaths directly due to childbearing, and in this group, although infection with the streptococcus pyogenes is a danger just as in the previous group, the most important factor is probably the serious injury to the maternal tissues which determines the onset of a fatal infection with organisms other than the streptococcus pyogenes. These obstetric injuries occur because, in the experience of the Committee, (i) there is inadequate ante-natal anticipation of obstetrical difficulties, (ii) many difficult obstetric operations are performed by persons whose training has been insufficient to fit them for the task, and (iii) there is too great a tendency to intervene in the normal case and to perform obstetric manipulations under unsuitable conditions.

2. *Toxaemias.*

Owing to too infrequent examination of urine and estimation of blood pressure, toxaemias are often not recognised in time, and even when recognised they are often inadequately treated. The causation of these toxaemias is not understood, and very little advance has been made towards new knowledge.

3. *Haemorrhage.*

The importance of "warning haemorrhage" is commonly not recognised in cases of ante-partum haemorrhage. Transfusion and infusion are too rarely practised after serious loss of blood.

4. *Pre-existing Disease.*

In the absence of a general medical examination, many cases of serious systemic disease are not recognised during pregnancy. There is, as a rule, inadequate management of pregnancy in heart disease, tuberculosis and nephritis. There is insufficient institutional accommodation for such patients. Rickets, now a preventable disease, has a most important bearing on maternal mortality, and its prevention should substantially reduce the maternal death rate.

II. ADMINISTRATIVE.

IMPERFECTIONS OF THE MATERNITY SERVICE.

1. *Training of Students.*

There is a serious lack of facilities. This is partly owing to the training of pupil midwives who will not eventually practise, and also to the fact that no satisfactory arrangements have yet been worked out between teaching hospitals and neighbouring Local Authorities to make beds in municipal hospitals available for teaching purposes.

2. *Facilities for Post-Graduate Instruction.*

Post-graduate facilities for doctors are inadequate. It is most difficult for older practitioners to obtain practical instruction in modern ante-natal work, even if they so desire.

3. *Encouragement of Specialisation.*

Little encouragement is given to young obstetricians and gynaecologists to establish themselves in the non-teaching provincial centres. The gynaecology in such places is often in the hands of general surgeons without special interest or experience in obstetrics, and the hospitals lack a gynaecological department. In these circumstances an obstetrician may find it impossible to develop his practice in the speciality to which he has devoted particular study, time and attention.

4. *Midwives.*

The Committee have been much impressed by the need for better instruction of midwives in ante-natal care and nursing methods. There is dissipation of effort among different training centres, which are too numerous and vary widely in efficiency. There is great need for "refresher" courses. Except in certain rural areas there is at present no organised service of midwives, with adequate status and traditions of its own. The independent midwife is often harassed by financial anxiety, and the absence of security is discouraging.

5. *Untrained Handywomen* are unfortunately still extensively employed as maternity nurses.

6. *Ante-natal Supervision.*

There is too little ante-natal supervision by general practitioners and midwives, and what there is is often too perfunctory to deserve the name. Ante-natal clinics are too often conducted by those who are not practical obstetricians, and there is lack of co-ordination between them and those conducting the deliveries. An ante-natal clinic unconnected with a hospital is often seriously hampered by being unable readily to obtain in-patient treatment for abnormalities that may be discovered at the clinic. At many clinics the discovery of an abnormality involves delegating responsibility; this may lead to regrettable and dangerous delay, and there is in some cases no effective organisation for ensuring the continuance of obstetric supervision and treatment.

7. *Hospital Accommodation.*

There is urgent need for more beds for ante-natal abnormalities, including inter-current disease, and for the admission of cases of sepsis at an early stage. Maternity hospitals often suffer from a lack of responsible medical control and co-ordination, and difficult cases are too often dealt with by an inexperienced junior resident.

B. Summary of Recommendations.

1. *Sepsis (Puerperal Infection).*

Suggestions as to the necessary antiseptic toilet have been put forward on pages 112 to 114. The use of rubber gloves in the conduct of labour is advocated for the reasons given on page 115. In view of the accumulating evidence of the danger of droplet infection from the mouth and nose of attendants and others, the use of adequate masks is strongly advised. Sufficient beds should be available for difficult obstetrical cases and for the early admission of cases with puerperal infection.

2. *Toxaemias.*

There should be a more effective examination of urine and estimation of blood pressure during pregnancy, and in order to carry this out it is advisable that midwives should be trained to make blood pressure determinations. More beds should be provided for the treatment of toxaemias in their early stages, and the importance of early and adequate treatment of these conditions should be much more fully realised.

3. *Haemorrhage.*

If a case of "warning haemorrhage" occurs, the patient should be placed without delay in a suitable institution. The doctor's midwifery equipment should include apparatus for intra-venous injection. Blood transfusion services should be more generally organised.

4. *Pre-Existing Disease.*

Every pregnant woman should have a routine medical examination by a doctor during the early months of pregnancy. More hospital accommodation should be provided for the treatment of cases of heart disease, tuberculosis and nephritis associated with pregnancy. Where it appears that further childbirth will endanger life, medical advice should be given as to the prevention of pregnancy. More vigorous efforts should be made to apply effectively and widely the new knowledge now available for the prevention of rickets.

5. *Maternity Services.*

(a) Training of medical students. Recommendations as to the education of the student in obstetrics have been put forward in the Interim Report. The Committee wish to impress on teaching Hospitals and Local Authorities the need for their co-operation in the provision of facilities for the instruction of students in obstetrics. In order to avoid the present serious "wastage" of cases in the instruction of pupil-midwives who will not ultimately practise midwifery or take posts as health visitors, the C.M.B. certificate should not be made a requisite for appointments in which midwifery experience is not essential.

(b) Facilities for post-graduate instruction. The Committee recommend that steps should be taken to provide increased opportunity, either at special post-graduate hospitals or elsewhere, whereby doctors already in practice may be enabled easily to obtain further practical instruction in ante-natal care and in obstetrics.

(c) Training and employment of midwives. The Committee recognise that another official Committee has dealt with this problem, and with their recommendations they are in general agreement. They consider that some means should be found for providing post-certificate experience before registration as a practising midwife. "Refresher" courses should be provided for midwives already in practice, and special efforts made to encourage their attendance.

The Committee consider that a handywoman should never be employed as a maternity nurse and that a trained midwife should always be available to carry out maternity nursing in cases attended by a doctor or a medical student working under a doctor's direction.

(d) Ante-natal supervision. The care of the patient during pregnancy should, whenever possible, be undertaken by the person who will be responsible for the delivery. There is great need for more general staffing of ante-natal clinics by medical officers who are closely in touch with the actual practice of midwifery, whether they be obstetric specialists or general practitioners. Furthermore, ante-natal clinics should, whenever possible, have an intimate working connection with a hospital where maternity beds are available. Measures should be taken to educate the public as to the need for ante-natal care, and as to what it may be expected to accomplish when efficiently carried out.

(e) Maternity hospitals. With reference to maternity hospitals, the Committee desire to make the following recommendations:—

- (i) that cases of puerperal sepsis, whether arising in hospital or admitted from outside, should not be treated on the premises of a maternity hospital, unless an entirely separate block, separate nursing and ward staff and separate staff accommodation are provided;
- (ii) that for emergency or other cases which may be a source of danger on account of potential sepsis, special provision (separate small wards and labour wards, with special allocation of staff) should be made;
- (iii) that cases of abortion should not be admitted to ordinary maternity wards;
- (iv) that in the interests of economy, as well as to facilitate specialist treatment of non-obstetric conditions associated with pregnancy and childbirth, new maternity accommodation should, where practicable, be associated with general hospitals;
- (v) that very large maternity units are disadvantageous in that the essential personal supervision, both medical and administrative, is difficult to maintain.
- (vi) that the method of medical staffing of maternity hospitals so as to secure prompt specialist service for serious cases calls for reconsideration as indicated in the Report.

6. *Development and Co-ordination of Existing Maternity Services.*

The essential services considered by the Committee necessary to secure a higher standard of care for the mother during pregnancy, labour and the puerperium were formulated by the Committee in the Interim Report and may be briefly recapitulated here:—

- (i) The provision in every case of the services of a registered midwife to act either as midwife or as maternity nurse (the midwife being responsible for normal midwifery and for routine ante-natal supervision).
- (ii) The provision of a doctor to carry out ante-natal and post-natal examination in every case, and to attend as may prove necessary during pregnancy, labour and the puerperium, all cases showing any abnormality.
- (iii) The provision of a consultant, when desired by the attending doctor, during pregnancy, labour and puerperium.
- (iv) The provision of certain ancillary services, dentistry, home helps, sterilised outfits and facilities for pathological investigation as desired by the doctor.

7. *Encouragement of Specialisation.*

The Committee consider it important, in order that expert obstetric advice and assistance may be readily available in every part of the country, that gynaecological departments should be

established, when they do not already exist, in all the larger non-teaching provincial hospitals, and that such departments should be staffed not by general surgeons but by obstetricians.

8. *Inquiries into Maternal Deaths.*

The Committee desire to see confidential inquiries into the circumstances of maternal deaths continued by the Public Health Authorities, but deprecate the institution of a system of inquiry by a Coroner into every maternal death as a matter of routine.

In concluding their task the Committee wish to express their thanks to the Medical Officers of Health and medical practitioners in all parts of the country who have co-operated with them and assisted them in obtaining the necessary data for this inquiry. They also appreciate very highly the able services rendered to them by Mr. G. F. Gibberd, M.S., F.R.C.S., Assistant Obstetric Surgeon, Guy's Hospital, and Mr. Arnold Walker, F.R.C.S., Obstetric Surgeon, The City of London Maternity Hospital, who have undertaken during the four years the careful examination and assessment of the reports of all the deaths of women in childbirth which have been considered by the Committee. This scrutiny has been performed with judgment and impartiality, which has won and retained the unanimous confidence of the Committee. Still greater is the Committee's obligation to their Secretary, Dr. Jane H. Turnbull, of the Medical Department of the Ministry of Health. Throughout the protracted period of their investigation the Committee and their Sub-Committees have learned the value of her knowledge, skill and experience, and they desire to place on record their sincere gratitude for her guidance, patience and manifold labours.

(Signed) GEORGE NEWMAN, *Chairman.*
 F. J. BROWNE.
 JANET M. CAMPBELL.
 E. CASSIE.
 LEONARD COLEBROOK.
 ARCHIBALD DONALD.
 CHAS. E. S. FLEMMING.
 WALTER M. FLETCHER.
 H. KERR.
 W. H. F. OXLEY.
 MILES H. PHILLIPS.
 C. E. TANGYE.
 O. L. V. S. DE WESSELOW.

JANE H. TURNBULL, *Secretary.*
July, 1932.

APPENDICES.

1. England and Wales. Birth and Death Rates per 1,000 living; Infantile Mortality rates; and Mortality of Women in or associated with Child-birth per 1,000 Children born alive, 1911-1931.
 2. Circular 1167. "Maternal Mortality." December 11th, 1930.
 3. Memorandum 156/M.C.W. "Maternity and Child Welfare." December 11th, 1930.
 4. Letter to Medical Officers of Health from Sir George Newman. "Bacteriological investigation with reference to puerperal sepsis." February 25th, 1932.
 5. Form suggested by the Committee for use by midwives in referring antenatal cases to general practitioners.
 6. Registrar-General's Note (supplement to Chapter IV).
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APPENDIX I.

The situation is made manifest in the following composite table prepared for the Committee by the Registrar-General:—

England and Wales. Birth and Death Rates per 1,000 living; Infantile Mortality rates; and Mortality of Women in or associated with Childbirth per 1,000 Children born alive, 1911–31.

Year.	Birth rate.	General Death rate.	Infantile mortality rate.*	Puer-peral Sepsis.	Other puer-peral causes.	Total puer-peral mortality.	Non-puer-peral causes.	Total Maternal Mortality.
1911–15	23·6	14·3	109	1·42	2·61	4·03	0·99	5·02
1916–20	20·1	14·4	91	1·51	2·61	4·12	1·68	5·80
1921–25	19·9	12·2	75	1·40	2·50	3·90	1·14	5·04
1911 ...	24·4	14·6	129	1·43	2·44	3·87	1·04	4·91
1912 ...	24·0	13·4	95	1·39	2·59	3·98	0·97	4·95
1913 ...	24·1	13·8	109	1·26	2·70	3·96	0·91	4·87
1914 ...	23·8	14·0	104	1·55	2·62	4·17	0·95	5·12
1915 ...	21·8	15·7	106	1·47	2·71	4·18	1·09	5·27
1916 ...	21·0	14·3	91	1·38	2·74	4·12	0·94	5·06
1917 ...	17·8	14·2	91	1·31	2·58	3·89	0·95	4·84
1918 ...	17·7	17·3	98	1·28	2·51	3·79	3·81	7·60
1919 ...	18·5	14·0	93	1·67	2·70	4·37	1·98	6·30
1920 ...	25·5	12·4	85	1·81	2·52	4·33	1·13	5·46
1921 ...	22·4	12·1	81	1·38	2·53	3·91	1·09	5·00
1922 ...	20·4	12·8	75	1·38	2·43	3·81	1·35	5·16
1923 ...	19·7	11·6	69	1·30	2·51	3·81	1·01	4·82
1924 ...	18·8	12·2	74	1·39	2·51	3·90	1·16	5·06
1925 ...	18·3	12·2	75	1·56	2·52	4·08	1·07	5·15
1926 ...	17·8	11·6	70	1·60	2·52	4·12	1·02	5·14
1927 ...	16·6	12·3	70	1·57	2·54	4·11	1·32	5·43
1928 ...	16·7	11·7	65	1·79	2·63	4·42	1·20	5·62
1929 ...	16·3	13·4	74	1·80	2·53	4·33	1·49	5·82
1930 ...	16·3	11·4	60	1·92	2·48	4·40	—	—
1931 ...	15·8	12·3	66	1·66	2·45	4·11	—	—

* The rates for the years 1911–25 have been corrected for the violent fluctuations in the birth-rate during those years by stating the deaths in proportion to infants born alive during the same three monthly periods as those which died, and not to births registered in the same year.

APPENDIX II.

CIRCULAR 1167.

Maternity and Child Welfare Authorities.

MINISTRY OF HEALTH,

WHITEHALL, S.W.1.

11th December, 1930.

SIR,

MATERNAL MORTALITY.

I am directed by the Minister of Health to draw the attention of the Council to the Interim Report of the Departmental Committee on Maternal Mortality and Morbidity which has recently been published by H.M. Stationery Office.

The Government have considered the recommendations made by the Committee for removing the causes of preventable maternal death, and have decided to undertake the necessary negotiations with the various authorities concerned, with a view to formulating a scheme on a national basis for the care of maternity which would provide the services suggested by the Committee. But the Report makes it clear that two of the essential measures for securing a reduction in maternal mortality are (1) general and sustained efforts to enlighten the women of the country as to the importance of ante-natal supervision, and (2) the improvement and expansion, where necessary, of the maternity services of Local Authorities, which must form an important part of any national scheme.

The Minister recognises that in many areas the Local Authorities and Voluntary Associations have already realised the importance of fully exercising their powers for the care of maternity, but there is still much to be done if the preventable maternal deaths are to be prevented. He desires to commend to the earnest attention of all Councils the suggestions in the accompanying Memorandum for improving and developing their maternity services, and for securing that the women most in need of these services are persuaded to make use of them.

The Minister feels sure that the Council will be anxious to do all that is reasonably possible in this matter. The additional expenditure involved in any area will be small in comparison with the advantages that would result from the provision of the necessary facilities, and their full use by those for whose benefit they are provided, and I am to remind the Council that the development of the maternity and child welfare services is one of the extensions of local services in consideration of which an additional amount of £5,000,000 was included in the General Exchequer Contribution for each year in the first fixed grant period under the Local Government Act, 1929.

I am also to point out that the Act provides that the amount of the General Exchequer Contribution shall be revised periodically, and that at each revision it shall, subject to the necessary provision by Parliament, be fixed by reference to the total amount of the rate and grant expenditure incurred by all local authorities in the last year for which particulars are available as compared with the amount of that expenditure in the year 1930-31.

The Minister will be glad to be informed as early as practicable of the action which the Council decide to take after consideration of this Circular and the enclosed Memorandum.

A further copy of the Circular and Memorandum are enclosed, which should be handed to the Financial Officer.

I am, Sir,

Your obedient Servant,

A. B. MACLACHLAN,

Assistant Secretary.

The Clerk of the Council.

or

The Town Clerk.

APPENDIX III.

MEMO. 156/M.C.W.

MATERNITY AND CHILD WELFARE.

I. ANTE-NATAL SERVICES.

1. The Departmental Committee on Maternal Mortality and Morbidity, which was appointed by the Minister of Health in June, 1928, have submitted an Interim Report, which was published in July of the present year. This Report has furnished both the Government and the public with many new facts and conclusions in regard to the subject. As a result of their investigation into 2,000 deaths of women in childbirth during the two years, the Committee came to the conclusion that there were *four primary avoidable causes* in the train of events which led up to a fatal issue. First, there was absence of ante-natal care in 17 per cent. of the deaths; secondly, there were errors of judgment in practice or treatment by doctors or midwives in another 17 per cent.; thirdly, there was lack of reasonable facilities available for effective medical care in 5 per cent. of the cases; and fourthly, in 9 per cent. there was negligence of the patient, or her friends, to adopt or carry out medical advice offered to them. Thus not less than 48 per cent. of the total deaths from childbirth into which inquiry was made seemed to the Committee to have been avoidable. In the remaining 52 per cent. of the records of death examined no preventable factor actually emerged, but in some cases, owing to incompleteness of the records, it was not possible to come to a definite conclusion.

In summary, the Committee found that of the cases of death brought to their notice *not less than one-half were directly preventable* under suitable conditions. These findings not only confirm previous impressions that much mortality and morbidity associated with childbearing might be prevented, but indicate the kind of unsatisfactory conditions which must be removed or ameliorated if we are to secure, as we must, a reduction in the relatively high maternal mortality rate of the country, not only in those districts where the maternal mortality has been highest over a number of years, and in which little decline, if any, has occurred, but in the country as a whole.

Generally speaking, it is clear from cumulative experience of the work of the maternity services in their present form that the solution of this complex problem is most likely to be found in an all-round tightening up as well as strengthening of each link in the chain of obstetric supervision, and an increased watchfulness over all stages of pregnancy and labour rather than in any single arresting or comprehensive remedy. Much of this improved supervision will come about gradually if the education and training of the medical student and the midwife are designed to equip them to appreciate more closely the extreme importance of painstaking attention to detail, as well as to understand and apply the scientific methods of sound treatment. Moreover, the influence of a better informed public opinion, and the effective education of the mother herself, whether through direct instruction, or through the action of voluntary organisations, or the indirect effect of a readily available and adequate maternity service, should also prove beneficial in securing a higher and safer standard of practical midwifery.

"It is certain," the Committee say, "*that an excessive maternal mortality can be prevented, for in some lying-in institutions, and in large groups of women in confinement at home, it is already being prevented by these very means. What is being done for some women can, and should, be done for all.*" Some examples of such successful midwifery may be mentioned. From the years 1924-1928 inclusive, the hospital and district cases of the *British Hospital for Mothers and Babies at Woolwich* numbered 4,221, and the maternal mortality rate was 0·71 per thousand births; at the *East End Maternity Hospital* (1921-1928) the hospital and district cases numbered 17,525, and the maternal mortality rate was 0·68; at the *General Lying-in Hospital in Lambeth* (1920-1929) the hospital and district cases numbered 25,906, and the maternal mortality rate was 1·31; in the year 1928 the *Queen's Institute Nurses*

were responsible for 65,077 district midwifery cases, and the maternal mortality rate was 1·9; and the *Plaistow Maternity Hospital* (1910-1929) undertook 87,749 district cases and the maternal mortality rate was 0·77 per thousand. These figures compare very favourably with a total mortality rate for England and Wales in 1929 of 4·33 per thousand. The urgent, and indeed vital, importance of Local Authorities directing renewed attention to the matter is therefore obvious. Many Local Authorities have provided facilities for ante-natal supervision by the establishment of Ante-natal Clinics; but the Report shows that it is not sufficient to organise these Clinics and encourage doctors and midwives to use them. If a Clinic is to render the best possible service to the women for whom it is provided, it is desirable to associate the doctors and the midwives practising in the area much more directly with the Clinic and its staff.

2. The Ante-natal Clinic has a two-fold function:—

- (a) *Medical and nursing*, including the examination and routine supervision of such women as ask for it; assistance in the supervision of the patients of doctors and midwives referred by them for this purpose, and the examination of patients referred by doctors for the advice of an obstetric specialist.
- (b) *Educational and social*, including the practical teaching and advice given to the mother in regard to her own health and that of the infant, and the systematic following up of all women in attendance throughout their pregnancy.

The Ante-Natal Clinic should therefore be established and equipped as an *Ante-natal Centre* for all the maternity work of the area, to be in fact a place for advice and helpfulness for any expectant mothers who are in need of social and medical assistance from doctors, midwives or nurses.

The staffing, equipment and management of the Ante-natal Centre are dealt with in the memorandum which was circulated to Local Authorities in July, 1929. Many of the existing Centres do not at present reach the standard described in the memorandum, and it is important that efforts should be made, not only to establish further Centres where they are needed, but to secure that the present Centres are fully efficient.

3. The Ante-natal Centre has, however, the obvious disadvantage that the doctor in charge of the Centre seldom, if ever, actually delivers the patient, or is the doctor called in by the midwife in an emergency. In some cases this disadvantage can be overcome to a certain extent by keeping the patient's doctor fully informed of the findings at the Centre, but in many cases the medical officer of the Centre is not aware of the name of the doctor who may attend the confinement. It is, therefore, clearly desirable to encourage closer co-operation between the Centre and the doctors practising in the area which it serves.

4. In the case of women who engage a doctor for the confinement the necessary ante-natal supervision will be undertaken by him, and in the case of women who are insured persons the insurance practitioner is responsible for medical attendance during pregnancy. For these women the Ante-natal Centre should be available for any additional care the doctor considers necessary. But many uninsured women who engage midwives for the confinement are unable also to pay the fee of a doctor for ante-natal supervision, and for such women the necessary provision should be made through the maternity and child welfare service.

5. This can be done at an Ante-natal Centre if it is reasonably accessible to the patients, and they are willing to attend there. But in sparsely populated areas it is impracticable to provide Centres within a reasonable distance of the homes of most of the women concerned, and in towns there are many women who cannot be persuaded to attend the Centres. In some rural areas the County Councils are making arrangements with private medical practitioners whereby the latter undertake the routine ante-natal examination of

uninsured women who have engaged midwives for the confinement. Arrangements of this kind might well be made by Local Authorities, not only in rural areas, but also in towns to meet the needs of those uninsured women who are reluctant to visit a Centre for the purpose of ante-natal examination.

6. It is suggested that a list might be prepared by the Authority of those doctors practising in the area who are willing to undertake this service for uninsured women who engage midwives. The latter should be urged to explain to their patients the advantages of consulting a doctor during pregnancy, and, if they are unwilling to attend at the Centre, encourage them to select one of the doctors on the list, who should be the doctor to be called in by the midwife if any emergency should arise. The doctor would arrange to conduct the ante-natal examination either at the patient's home or at his surgery, and he should be offered the facilities of the Centre, including the services of the nurse or the health visitor, for the necessary following up of the case and subsequent supervision. In some cases arrangements might be made for the doctor to conduct the examination at the Centre with the patient's consent. The midwife engaged by the mother should be kept fully informed and encouraged to undertake as much of the ante-natal care as she is in a position to do. It is essential that the full co-operation of the midwives should be secured, and it should be made clear to them that these arrangements are designed in their interests as well as those of their patients.

7. Experience has shown that unless ante-natal supervision is adequately performed it may not only fail to benefit the patient, but may even involve additional risk by giving her a false sense of security. Under the Local Government (Qualifications of Medical Officers and Health Visitors) Regulations, 1930, the Medical Officer of an Ante-natal Centre is required to have had special experience of practical midwifery and ante-natal work, and it is suggested that there are definite advantages in securing for these posts the part-time services of private practitioners who possess the special qualifications prescribed by the Regulations. If possible, facilities should also be provided for other doctors to see their patients at the Centre if they so desire.

8. It is considered that arrangements on the above lines, co-ordinating the work of the Ante-natal Centres with that of the doctors and midwives, should prove to be one of the most helpful ways of teaching women to accept ante-natal supervision as part of the normal preparation for a confinement, rather than an emergency measure implying some dangerous or unusual condition. Such arrangements should also do much to secure medical advice for women expecting their first confinement, with its exceptional risks.

II. SUPPLY OF MIDWIVES.

1. It is now generally recognised that the services of a qualified midwife should be available for every confinement, whether she acts as a midwife in charge, or as a maternity nurse under the direction of a doctor. The employment of a midwife to carry out maternity nursing not only secures for both mother and child the advantages of skilled attention, but also obviates the risks associated with the employment of a handywoman or untrained "nurse."

2. In most rural areas both midwifery and maternity nursing can only be carried out satisfactorily by midwives employed by District Nursing Associations, and in many areas this is already done with financial assistance from the County Council. But there are still a number of rural parishes without midwives, and these are generally sparsely populated areas which cannot support a nurse-midwife without substantial assistance from the County Council. In such areas there is usually a special need for the services of a midwife if skilled attendance is to be available for the mothers, but there is often a difficulty in attracting a well-qualified and keen midwife owing to the paucity of both nursing and midwifery cases. This difficulty might be overcome with the assistance of the County Council by the formation of new District Nursing Associations covering a wide area, or by an extension of the

areas served by existing Associations, if such facilities as a motor-car and a telephone service were provided for the midwife. In some cases it might be found possible to secure for a more limited area the services of a midwife who has already had considerable experience, and who would welcome the opportunity of lighter work and greater leisure. It is hoped that this matter will receive careful consideration by the Councils of those Counties in which there are any areas without a supply of midwives.

3. In many urban districts there is a need for a better distribution of midwives, and for a greater use of their services for maternity nursing. Some Local Authorities already employ either whole-time or part-time municipal midwives, and there would be advantage in an extension of these arrangements. It is of course necessary to avoid the displacement of competent independent midwives already in practice in the district by other midwives appointed by the Local Authority, and to maintain the right of the mother to employ the midwife she prefers; but by the judicious support of midwives already in practice, and by placing midwives in areas where they would be unable to make a living without assistance, the Local Authority can ensure ready access to a midwife by all women requiring her services, and can also do much to improve the conditions of practice for the midwives.

4. The employment of handywomen is still a common practice in some urban districts, and it is not unusual to find that the midwives in these districts are by no means fully occupied and have difficulty in earning a living. In many cases a woman who engages a doctor for her confinement is unable also to pay the fee of a midwife to act as maternity nurse, and it is suggested that Local Authorities should encourage the employment of midwives in these cases by contributing to the fee of the midwife. It will be essential to secure the co-operation of the doctors practising in the district in persuading their patients to accept the services of a trained midwife for the maternity nursing.

III. CONSULTANTS.

Many Local Authorities already provide the services of a consultant in cases of puerperal fever and, in some instances, for cases of difficult labour. It is desirable that in each area the Local Authority should satisfy themselves that a consultant is available for any doctor who needs assistance in difficulties or complications arising during pregnancy, or at or after confinement. It will generally no doubt be found desirable to engage for this purpose the consultant at the Maternity Hospital or Ante-natal Centre serving the area.

IV. HOSPITAL BEDS.

In some areas there is still a need for further provision of hospital accommodation, (1) for cases needing institutional treatment, including not only complications of labour and the puerperium, but also patients suffering from abnormal ante-natal conditions and inter-current diseases, and (2) for patients whose home conditions are unsuitable for a confinement. In Counties and County Boroughs, the Councils may be able to provide the necessary beds by the adaptation of accommodation in institutions transferred to them under the Local Government Act, 1929.

It is suggested that Local Authorities should consider, wherever practicable, the desirability of affording facilities to private practitioners to attend their own patients in maternity institutions.

V. PROVISION OF ANCILLARIES.

Some or all of the following services have already been provided in many areas, and it is suggested that Local Authorities should consider the desirability of making provision through the Centres for such of these services as are not already available in their districts.

- (1) Sterilised maternity outfits for patients for whom either the doctor or the midwife considers that this provision is desirable.

- (2) Home helps for domestic assistance during the lying-in period, and also during pregnancy in those cases in which there are abnormal conditions rendering it dangerous for the woman to continue her usual household work.
- (3) Supply of milk for expectant and nursing mothers.
- (4) Provision of laboratory facilities for the examination of pathological material submitted by doctors.

VI. EDUCATION.

Whatever provision is made for the care of maternity, it is clear that further efforts are necessary to persuade women to take advantage of the facilities provided. This is especially true of ante-natal supervision, and there is a need in every area for a campaign of enlightenment on this subject. Local Authorities are in the best position to organise such a campaign with the assistance of their Medical Officers and Health Visitors, but it will be essential to secure the co-operation of the doctors and midwives practising in their areas, and of suitable voluntary organisations concerned with the welfare of women. It is hoped that all Local Authorities will give special consideration to the importance of educating public opinion on this vital matter.

Officers of the Department will gladly confer with Authorities who are desirous of improving or extending their existing arrangements and do anything in their power to facilitate progress.

MINISTRY OF HEALTH,

LONDON, S.W. 1.

December, 1930.

APPENDIX IV.

MINISTRY OF HEALTH,

WHITEHALL, S.W. 1.

25th February, 1932.

BACTERIOLOGICAL INVESTIGATION WITH REFERENCE
TO PUERPERAL SEPSIS.

DEAR SIR,

The Departmental Committee on Maternal Mortality, as you are aware from their Interim Report, have given special attention to problems connected with puerperal sepsis. At an early stage of their examination of the maternal death enquiry forms, they were impressed by the number of fatal cases of puerperal sepsis in which no source of infection had been traced, and it appeared to them desirable that combined epidemiological and bacteriological investigation should be more often undertaken, in particular with a view to defining the responsibility of the throat "carrier" and to investigating the role played by other infective conditions in persons in contact with the patient.

The Committee recommended that, if possible, arrangements should be made to carry out such investigations at a central laboratory, at which suitable agglutinating sera for identifying types of haemolytic streptococci (*streptococcus pyogenes*) would be available, and that a full-time bacteriologist should be appointed for this special work.

By arrangement between the Ministry and the Medical Research Council, Dr. Dora Colebrook, a bacteriologist with special experience in this branch, has now been appointed by the Medical Research Council for this purpose, and commenced work on January 1st, 1932, in the new laboratories of Queen Charlotte's Hospital, Hammersmith.

The importance of adequate bacteriological investigation in the problems which confront the Medical Officers of Health of Local Authorities in relation to such matters as the conduct of Maternity Homes and the suspension of midwives is evident. Administrative difficulties not infrequently arise from bacteriological uncertainty as to strains of streptococcus, and it is hoped that by placing these new facilities at the disposal of Medical Officers of Health it will be possible in many cases to give prompt and valuable guidance.

A number of agglutinating sera prepared at the Ministry's Pathological Laboratory are already available for typing puerperal strains. In certain cases, therefore, it may be possible within a few days to come to a decision as to whether the strain of the patient is of the same type as that of a throat strain. In other cases, when the patient's strain does not correspond with any of the stock sera, it will be necessary to prepare a serum for it and some weeks must then elapse before the final verdict can be given. When prepared, however, this serum will be ready for the rapid identification of strains from subsequent cases should they arise.

It will be seen that Dr. Colebrook's time will be fully occupied with this special typing; it will not be possible for her, save in exceptional circumstances, to undertake the routine examination of strains from isolated cases. It is hoped, however, that the bacteriologists who isolate strains of haemolytic streptococci from such cases will be good enough to preserve them, so that in the event of a second case occurring, such strains, together with the new material, may be sent *without delay* to Queen Charlotte's Laboratory.

In certain circumstances it may be desirable to arrange for an investigation of an outbreak of sepsis by a Medical Officer of the Ministry, and the Medical Officers of the Department will be prepared, as heretofore, to advise in such outbreaks.

In order to save time the Medical Officer of Health should communicate directly with Dr. Colebrook, and should, at the same time, inform the Ministry that he has done so, giving a short report of the cases of infection which have occurred.

When it is desired to send material for examination the following procedure should be adopted:—

(1) To determine the bacteriological nature of the patient's infection a swab should be taken from the cervix uteri or upper vagina.

(2) To trace the source of the infection (if this should prove to be due to streptococcus pyogenes) swabs should be taken from the tonsils and nose of the patient herself, and from those who were most closely in contact with her during the confinement and for 48 hours after delivery. In order to avoid unnecessary delay, these swabs should usually be taken at the same time as that from the patient's genital tract, and sent together, by post or by hand, duly labelled, to:—

Dr. Dora Colebrook,
Queen Charlotte's Hospital,
Research Laboratories,
Ravenscourt Square,
London, W. 6.

For the throat and nose, the ordinary diphtheria swabs may be used. They may also be used for swabs from the cervix, but one mounted on malleable aluminium wire and somewhat longer is preferable. A preliminary report on these swabs will be made as soon as possible by Dr. Colebrook and sent direct to the Medical Officer of Health.

Although the healthy throat carrier may be a most important source of infection, it is hoped that medical practitioners will bear in mind the possibility of infection having arisen from other streptococcal conditions in the patient, her attendants or her family, such as septic sores of the skin, running ears, recent tonsillitis, erysipelas, etc.

Yours faithfully,
GEORGE NEWMAN.

The Medical Officer of Health.

APPENDIX V.
Ante Natal Record.

MIDWIFE.		DOCTOR.	
<div>(1) Mrs. First seen Date of last period Date of expected conf.</div> <div>(2) Previous Pregnancies 1. 2. 3. 4. 5. (continue overleaf)</div> <div>(3) Previous illnesses</div> <div>(4) General condition pulse height (approximate) constipation breasts vaginal discharge varicose veins other abnormalities</div> <div>(5) Are the home conditions suitable for the confinement ?</div> <div>(6) Obstetric condition</div>		<div>1st examination General condition Heart Lungs Blood pressure Teeth Urine Other observations</div> <div>My opinion as to the patient's general health is as follows :—</div> <div>Signature</div> <div>Date</div> <div>Examination at 36th week (see 4 and 5 opposite) Obstetric condition</div> <div>General condition</div>	
Fold here only			
<div>Relation of head to pelvis at 36th week 38th week 40th week</div>			
<div>I have reviewed the midwife's observations, and have personally examined Mrs..... and I am of the opinion that</div> <div>Doctor's signature..... Date</div>			

Suggestions as to Ante-Natal Examination by Midwife.

1. The patient should be booked and examined as early as possible, preferably before the end of the sixteenth week unless, owing to trouble at a previous confinement, she has been asked to attend earlier. The date of the first day of the last period, and the approximate expected date of confinement, should be entered.
2. A history of previous pregnancies, labours and puerperia (e.g., normal, miscarriage, forceps, dead child, etc.) should always be obtained and noted in order.
3. On the first visit an account of any previous illness, e.g., heart disease, kidney disease, scarlet fever, etc., should be taken and entered on the form.
4. An idea of the general condition should be obtained, e.g., robust, thin, nervous, etc., and noted; also defective teeth, discharging ears, etc. The pulse rate should be taken and any irregularity noted. The approximate height should be stated (small stature often means a small pelvis). Inquiries should be made as to digestion, constipation, etc. The condition of the breasts should be ascertained, and the patient inspected for vaginal discharge and varicose veins, etc.
5. The suitability of the patient's home for a confinement should be considered and a visit paid, if necessary. If seriously defective conditions are found, they should be reported to the Medical Officer of Health as early as possible after booking.
6. At the 28th week the pelvic measurement should be taken, the height of the uterus above the pubes and the greatest circumference of the abdomen, the presentation and position of the child should be ascertained, and the foetal heart listened for. The urine must be examined for albumin and other abnormalities. These results must be entered in the appropriate place on the form.

From the 28th week onwards an examination should be made every fortnight and the results entered.

At every examination from the 36th week the relation of the presenting part to the brim of the pelvis must be found out and entered either as "above the brim," "engaging in the brim" or "in the pelvis."

APPENDIX VI.

SUPPLEMENT TO CHAPTER IV.

NOTE BY REGISTRAR-GENERAL.

(i)

Joint Causes of Death.

In the case of multiple causes of death upon a medical certificate, one only can be employed under the usual system of statistical tabulation, and this cause is determined by the application of a code of arbitrary selective rules. These codes may be divided into two classes:—

1. Those which enunciate principles of classification without defining their detailed application, and
2. Those which provide for specific combinations met with in the death registers.

Codes of the first class are short and simple in form, but in practice often fail to secure uniformity of treatment, the principles laid down being capable of diverse applications in particular cases. The second class affords more precise guidance, but tends to be unwieldy and more difficult of application.

The rules in use in this office, which are also used in Northern Ireland, and the Scottish rules, are printed on pages xxi-xxv of the Manual of the International List. The English rules are of mixed type, but the Scottish are of the first class. The rules in use in Germany and Sweden are also of the first class.

A code of general rules was adopted by the Commission revising the International List in 1900, and confirmed by the 1920 Conference. The Official French edition of the 1900 Manual also contained a detailed list of rulings for every combination of two diseases not assigned to the same heading of the Detailed International List, but this code has never been revised to bring it into line with later revisions of the International List. This form of code has been adopted by the United States and New Zealand.

The rules in use in other countries have not, so far as is known in this Department, been published.

Practice of General Register Office.

Puerperal sepsis and phlegmasia alba dolens are included in Group 1 on page xxii of the Manual. This high preference results in practically all deaths so certified being classified to these causes; other puerperal causes occurring in conjunction with the non-puerperal diseases specified in Groups II, III and IV, and in Rule 9 would be classified to the non-puerperal disease; other combinations of puerperal and non-puerperal causes are governed by Rule 10, which would in many cases give preference to the non-puerperal disease as the disease of longest duration.

Tables LXII and LXIV of the Text Volume for 1928 show that of the 3,710 deaths with mention of puerperal condition 2,920 deaths were assigned to puerperal and 790 to non-puerperal causes. In rather more than half of the latter the puerperal condition was returned as "pregnancy" or "child-birth," and it is not known in how many of these cases death occurred in the course of a normal pregnancy or puerperium. Prior to 1911, certifying practitioners were asked to include childbirth on the certificates of women dying within a month of parturition, even if it were not a contributory cause of death, and it is believed that this practice is continued by some of the older practitioners, although in 1911 the instruction was amended as follows:—"Whenever parturition or miscarriage has been in any way a contributory cause of death, the fact should be mentioned on the certificates."

The Scottish medical certificate was amended in August, 1929, to include the following:—If the deceased was a married woman, and the death was known to have occurred during pregnancy or within four weeks thereafter, the certifier will indicate the fact by here inserting the word "Yes."

An affirmative statement is taken into account in classifying the certified cause of death, but where the latter has no obvious relation to the puerperal condition, the classification follows the cause as certified.

A comparison of the English and Scottish rules will show that the latter give a much higher preference to the non-septic puerperal causes which accounts for the higher puerperal rate in Scotland. It is probable that the Scottish puerperal rate is more comparable with the total maternal mortality rate than with the puerperal rate in England and Wales.

No superiority is claimed for the English rules. In fact, it is recognised that they might be improved. The operation of Rule 10, which gives undue preference to chronic diseases of a low fatality when occurring in conjunction with certain acute diseases or other local diseases of a higher fatality, is opposed to the general principle in other systems.

In 1911, when the International List was first used in England and Wales, it was considered advisable to continue these rules which had then been in existence for ten years and so to secure continuity of our records rather than to abandon them in favour of the International rules which at that time were not acceptable in all countries which had adopted the Detailed International List.

A new form of medical certificate was introduced in England and Wales on the 1st July, 1927, after being approved by representatives of the principal medical bodies sitting as a Medical Advisory Committee (Chairman—Sir Humphry Rolleston) to advise the Registrar-General in respect of the decennial revision of the International List. The statement of the causes of death in this certificate was designed to obtain a more definite expression of opinion from the certifier respecting the disease which caused the death of his patient with the ultimate object, at some later date, of abandoning the system of arbitrary selective rules.

The International List as revised in 1929 will shortly be brought into use and it is then proposed to apply the selective rules only in those cases where it is apparent that the certifier has failed to enter the causes in their proper order.

(ii)

Detailed International List (revised 1929).

Pregnancy, Labour and Puerperal State.

140. Abortion with septic conditions.
141. Abortion without septic conditions being mentioned (including haemorrhage).
142. Ectopic gestation.
143. Other accidents of pregnancy (haemorrhage excluded).
144. Puerperal haemorrhage
 - (a) placenta praevia
 - (b) other haemorrhage.
145. Puerperal septicaemia (not specified as consequent upon abortion)
 - (a) puerperal septicaemia or pyaemia.
 - (b) puerperal tetanus.
146. Puerperal albuminuria and eclampsia.
147. Other toxæmias of pregnancy.

- 148. Puerperal phlegmasia alba dolens, embolism, or sudden death (not specified as septic)
 - (a) phlegmasia alba dolens and thrombosis
 - (b) embolism.
- 149. Other accidents of childbirth.
- 150. Other or not specified conditions of the puerperal state.

(iii)

Detailed International List as elaborated in the Registrar-General's Department and now in use.

Puerperal Headings of the Detailed International List (1929 Revision).

Note.—The lettered divisions are international; the numbered divisions have been adopted by the Registrar-General.

XI.—*Diseases of Pregnancy, Childbirth and the Puerperal State.*

- 140. 145. Puerperal sepsis
- 140. Post-abortion sepsis.
- 141. Abortion not returned as septic.
 - 1. Haemorrhage following abortion
 - 2. Without record of haemorrhage.
- 142. Ectopic gestation.
- 143. Other accidents of pregnancy.
- 144. Puerperal haemorrhage
 - (a) Placenta praevia.
 - (b) Other puerperal haemorrhage.
- 145. Puerperal sepsis not returned as post-abortion
 - (a) Puerperal septicaemia and pyaemia
 - (b) Puerperal tetanus.
- 146. Puerperal albuminuria and convulsions
 - 1. Puerperal convulsions
 - 2. Other conditions included under 146.
- 147. Other toxae-mias of pregnancy.
- 148. Puerperal phlegmasia alba dolens, embolism, and sudden death
 - (a) Puerperal phlegmasia alba dolens not returned as septic
 - (b) Puerperal embolism and sudden death.
- 149. Other accidents of childbirth.
- 150. Other or unspecified conditions of the puerperal state
 - 1. Puerperal insanity
 - 2. Puerperal diseases of the breast
 - 3. Childbirth (unqualified).

Basis of Calculation of Mortality of Women from Puerperal Causes.

(Information supplied by the Registrar-General from reports in the Library of the General Register Office.)

*I. Countries using detailed
International List.*

Basis of Calculation.

England and Wales	Live births and total births.
Scotland	Live births.
Northern Ireland ...	...
Irish Free State ...	...
Australian Commonwealth ...	...
New Zealand ...	...
Dominion of Canada	Live births and female population.
United States of America ...	...
Union of South Africa	Total population.
Czechoslovakia ...	...
Greece	On 10,000 "accouchements" and female population.
Holland ...	...
Spain	Numbers given but no rates.
Japan ...	...
Chile ...	...
Colombia ...	...

*II. Countries using other
Lists.*

France (Short International List*) ...	...	Total population.
Sweden (100 headings) ...	...	100,000 accouchements.
„ 1931 ...	...
Italy (264 causes) ...	...	"Accouchements."
Norway (Scandinavian List)		Total "Accouchements."
Denmark (1930) 113 headings		Total population.
Finland ...	...	10,000 "Accouchées."
Germany {	1923 ...	Total births and female population.
	1924 ...	Live births, total and female population.
	1925 and 1926 ...	Female population.
	1927 and 1928 ...	Female population and total births.

* "International Short List" comprises only (a) Sepsis, (b) Other causes.



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by Wyman and Sons, Ltd., Fetter Lane, London, E.C. 4.

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